LNCS 8038

Simon K.S. Cheung Joseph Fong
Wilfred Fong Fu Lee Wang
Lam For Kwok (Eds.)

Hybrid Learning and Continuing Education

6th International Conference, ICHL 2013
Toronto, ON, Canada, August 2013
Proceedings

Springer

Lecture Notes in Computer Science 8038

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

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ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-39749-3 e-ISBN 978-3-642-39750-9
DOI 10.1007/978-3-642-39750-9
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2013943129

CR Subject Classification (1998): K.3.1, H.5.2-3, K.4.3, H.4, H.1.2, H.3.4-5, H.5.1, I.2.11, J.1

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Welcome to the 6^{th} International Conference on Hybrid Learning (ICHL 2013). This year, ICHL 2013 was held in Toronto, Canada, with our new host, the University of Toronto School of Continuing Studies.

Hybrid learning is undoubtedly a new frontier in education, as neither virtual nor physical resources alone can provide the best teaching and learning environment. It is not merely a simple combination of face-to-face and technology-mediated instruction, but also encompasses many different strategies for teaching and learning. Continuing education has become an indispensable part of the education system for a community, especially when a knowledge-based economy is emphasized.

This year, our focus was placed on hybrid learning, e-learning, open online learning, and continuing education. ICHL 2013 provided a platform for knowledge exchange on these areas among researchers and practitioners who share a common goal to enhance the quality of teaching and learning in this fast-changing knowledge world.

A total of 37 papers were selected for inclusion in this volume. The selected papers broadly cover topics on hybrid learning and continuing education, including computer supported collaborative learning, experiences in hybrid learning, pedagogical and psychological issues, e-learning and mobile learning, open education resources and open online courses, and issues in hybrid learning and continuing education.

We would like to take this opportunity to thank the following parties who made the conference a success: (a) the Organizing Committee; (b) the Program Committee; (c) the conference organizers; (d) the conference sponsors; (e) all the conference participants; and (f) all the supporters.

We trust you will enjoy reading these papers.

August 2013

Simon K.S. Cheung
Joseph Fong
Wilfred Fong
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The Re-invention of the Academy: How Technologically Mediated Learning Will – And Will Not – Transform Advanced Education

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Abstract. Hybrid learning and online courses have attracted a great deal of interest and considerable post-secondary hype, with critics describing the new technologies as representing the death of traditional universities and supporters promoting them as the most significant innovation in hundreds of years. This paper argues that the likely impact on technologically mediated learning has been significant exaggerated, in large measure because of the over-promotion of post-secondary education in North America and the declining level of curiousity, educational motivation and work ethic necessary for the kind of independent work necessary for success with digital learning. The current models are unlikely to be the category-killers suggested by contemporary alarmists but the new technologies hold the potential to bring about revolutionary change over time.

Keywords: MOOC, eLearning, Higher Education.

1 Introduction

In the global enthusiasm for Massive Online Open Courses and other forms of hybrid or technologically mediated learning, concerns have arisen about the very future of the university enterprise. Traditionalists decry the impending loss of faculty-student face-to-face encounter, even as financial pressures and changing institutional priorities have changed the undergraduate experience dramatically. As is often the case with these technological revolutions, the advantages of technologically-mediating learning has been seriously oversold and equally underestimated. This commentary reflects on the rhetoric around innovations in the academy and considers the realistic prospects for advanced education in the current political and economic environment. Far more rigorous analysis is required if we are to fully understand the options, policy issues and likely outcomes of the continued re-invention of the modern university system.

A great deal has been written and spoken about the impact of new educational technologies and new pedagogical approaches, much of it more rhetoric than substance. Politicians, particularly, in the United States, have seized onto the MOOC as a potential cost-saving measure. Why not require, as Florida and California

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 1–9, 2013.

legislators are considering, public institutions to provide credit for online courses offered by other providers, including for-profit companies? The bandwagon is getting crowded, as elite universities invest millions in brand-building MOOCs and as other institutions rush to get their content on line and to capitalize on the global potential of technology-mediated learning.

2 Educational Innovation

These are exciting times for educational innovators. In fact, the expansion of hybrid learning models and new technology-based instructional methods has created a tsunami of commentary about the end of the university as we know it, the cost-cutting potential of online courses, the inevitable shake-out in terms of post-secondary offerings, and the global integration of knowledge that could be associated with such a transformation. The stories about MOOCs and other innovations have a familiar pattern: innovative and award-winning teacher decides to adopt a technology-based approach, hundreds if not thousands of students sign up, class members join from Kazakhstan and Nigeria, demonstrating the global reach and power of the new approaches. Later, the story is amended a little. Very few of the students persisted with the course. Completion rates were very small. Testing has been inadequate and educational outcomes largely unknown. We are, in comparative terms, at the early stages of the educational dot-com boom, where euphoria competes with common sense, and where business models are based more on fantasy than practicality. It is certainly fun to watch and even more fun to be a participant – but it is not necessarily a foundation for full understanding of the evolution of the post-secondary system.

As a professional historian, I am compelled to put these technological developments in historical context. I will avoid going on about the most obvious comparisons, between the MOOCs and the BAPC, or the Broadly Available Portable Classroom, a wonderful if now dated concept that is more generally known as a book. The idea of distributing knowledge far and wide is not new. Indeed, the university system has been wrestling since the Middle Ages with the challenge of providing educational experience to more and more people. Universities were initially highly specialized, tied to churches and focused on theology and the core disciplines. The Germans, of course, created the modern technocratic university, with much of the apparatus in terms of departments, research principles and the like that now govern the global system. Other countries joined the German experiment, creating both private institutions, still generally tied to religious institutions, and public universities, the latter often more practical and applied in nature. After World War II, national governments bought aggressively into the concept of mass education, opening institutions to more women, working class people, ethnic minorities and new citizens. By the late 20th century, the age of mass university education had spread around the world, creating one of the most remarkable transformations in world history.

The modern university is, it seems, driven by two simple formulations, one personal and one societal. On the personal front, the concept is that

Earning = Learning

The greater the number of years of education – the statistics seemed to prove – the greater the personal income and/or career opportunities. People were exhorted to continue their studies at university, secure in the knowledge that a degree conferred great and reliable benefits. The Canadian numbers were simple: the average university graduate earned $1 million more over the course of their working life than the average community college graduate and $1.3 million more than an individual with only a high school diploma. In the era of university triumphalism, the logic behind the numbers was not seriously examined. For example, many high school diploma holders lack the motivation, work ethic, reliability and, dare one say it, intellectual abilities to succeed at university. Given that these characteristics are crucial to determining career success, it follows logically that those unable to continue their studies would not do as well economically.

The second, tied to the imperatives of national innovation, is a little more complex. This concept derives from the assumption that scientific and technological innovation is crucial to national competitiveness in the 21st century. The argument goes that Google and Facebook more than mining companies and car manufacturers will define this generation, and that both of the latter will succeed only if they adopt the most technologically advanced systems possible. So, in this concept of national competitiveness, the following formula holds:

A highly educated workforce + basic research + commercial support = innovative products + new companies + jobs + prosperity

On this model, national governments justified the massive expansion of curiosity-driven research, university enrollment, the number and variety of universities and technical institutes and government-supported business development initiatives. The approach sought to replicate the experience of California's Silicon Valley, where the juxtaposition of an elite research university (Stanford) and an entrepreneurial culture created a start-up economy of world-changing proportions. (Much less is said, in the Silicon Valley legend building, of the fundamental importance of having access to high levels of US military spending.) This approach, now replicated in hundreds of communities and regions around the world has been the foundation of the growth of the university enterprise globally.

Neither of these models worked particularly well. Silicon Valley has proven to be an elusive model to replicate and those areas that come close – Waterloo Region in Ontario being the best Canadian example – actually have deep entrepreneurial roots that pre-dated the growth of the university system. The earning equals learning model has also proved to be less reliable than governments, parents and students believed. Buying unreservedly into the mantra about the "knowledge economy," governments funded a massive expansion of the post-secondary system, growing the number of seats well past the capacity of the universities and colleges to continue to offer high quality education experiences. The same governments also bought into the research paradigm, funding basic and applied research at unprecedented levels but generating much less in the form of new jobs and emerging companies than anticipated. There were successes, to be sure, and every university in the country can point to several local companies that spun off from academic research. But the scale of the investment was not matched by the outcomes.

The same has been true of the personal benefits of post-secondary education. Canada has one of the highest post-secondary participation rates in the world. By all measures, the country has an extremely well educated and well-trained workforce. We also have a stubbornly high rate of unemployment among college and university graduates and, more worryingly, a very high rate of underemployment as well. Individual returns from post-secondary education are impressive for those with specialist degrees – engineering, accounting, medicine, finance – but less impressive for those with generalist degrees. There has also been dramatic credential inflation, with employers who used to hire high school graduates now opting for university degree holders, with a similar transition occurring at the level of undergraduate degree to graduate degree. Assessments on the Return on Investment – a particularly harsh way of judging the benefit of a university education – show declining returns for non-professional programs.

3 MOOCs

So, major questions relating the MOOCs, technology-mediated education generally and the changing educational and training needs of the modern world have to be addressed:

3.1 Do We Need More Educational Opportunities?

The short answer is "no." You cannot argue that eligible and qualified Canadian students cannot get into universities in this country. With the proliferation of campuses and the availability of distance delivery options, all motivated students in the country can find an institution that is willing to accept them. Canada has a strong and broad educational system; there is very little pent-up demand – save for exclusive, high quality professional programs like medicine – in the country. Making university education even more accessible is much like adding an extra scoop of ice cream to the bowl – nice, but not necessary. In contrast to what governments seem to believe, there is no large pool of qualified and highly motivated students clamoring for greater access to university. Equally important, top students either want a high quality, personalized educational experience or a fully accredited career-ready professional offering. The problem is not with the best students; they will adapt to new learning environments with comparative ease. The challenge, instead, is with the very large number of under qualified and under motivated students in the university system. The country does not need more educational opportunities. Instead, it needs high quality, demanding programs for the gifted students, remedial help for the academically disadvantaged, and basic, career oriented offerings for those with basic abilities but lacking a passion for learning.

3.2 Why Are Credentials More Important Than Actual Learning – And Why Will This Approach Not Hold? Media as Learning Tools

At this point in history, students are driven to get credentials, not necessarily to learn. The marketplace values specific training and the credentials associated with them. For decades, universities credentials were taken to represent certain core skills. To hold a degree was to offer an assurance to employers that one had advanced writing and reading skills, analytical abilities and a high level of motivation. The university degree is rapidly losing its value in the market, save for those programs that have external accreditation, like engineering, medicine, clinical psychology and nursing. To date, students and institutions have obsessed about credentials, with universities putting greater emphasis on retention and degree completion – and much less on competence and high level abilities. I believe that the world will be shifting soon to a very different approach, where competence trumps credentials. This is happened at the elementary and secondary level – witness the remarkable expansion of Sylvan Learning Centres, Kumon, Oxford and private educational services that focus on basic abilities. This imperative – ability over participation, competence over degree completion – is likely to be a major driver of university education in the coming years. Hybrid learning could well be critical in addressing these imperatives.

3.3 What Are the Major Problems with University Education and How Will Hybrid Learning Approaches Assist?

Many of the key advances in post-secondary education are addressing the wrong problems. Hybrid learning approaches work very well for helping motivated students with the material they are obliged to learn. They are much less successful at providing motivation in the first instance. You can lead students to the computer monitor – but you might not be able to get them off their Facebook page. The rapid growth in university participation has flooded the campus with significant numbers of students who are not engaged and often just not interested in real learning. Research shows that increasing numbers of students do not read much, even assigned readings, devote very little time to their studies, work for lifestyle reasons outside of university, and are not full engaged in their scholarly work. Highly motivated students benefit from all different learning styles and approaches. Unmotivated students respond to very little. The shift toward student friendly (and often quality-killing) methods by professors has the potential to strip the educational experience of much of its attraction. There are some excellent possibilities of using technology-mediated learning to judge student interest, ability and motivation – preferably before they even come to university – and to build student commitment to the courses. Universities should be putting a great deal more effort in hybrid learning into such areas as pre-university preparation, assisting weaker and unmotivated students, and monitoring student participation.

3.4 Will There Be a Sustained Global Market for North American University Education?

While studies suggest that there will be sustained global demand for North American university spots, there are reasons to be less optimistic. The rapid growth of university education around the world, plus growing evidence of widespread unemployment and underemployment among university graduates, suggests that the demand is not inexhaustible. While the status appeal of high quality Canadian universities will remain, the level of interest in second and third tiered universities will likely decline. There will likely be a steady supply of weak students, often with poor English language skills, but these will only add to the universities' challenges. Again, hybrid learning approaches could be used to considerable effectiveness in testing and preparing foreign students before they launch themselves into expensive and often demoralizing experiences at Canadian universities.

3.5 Are Universities Ready to Capitalize on the Opportunities Presented by Hybrid Learning?

Universities are, at root, very traditional institutions, slow to adjust to change and slow to respond to technological opportunities. For the most part, Canadian universities operate on 19th century models of instruction and course delivery. Those individuals who buy into the possibilities of hybrid learning often do so at considerable cost in terms of hours of work, effort expended and career-damaging commitments. In fact, advocates of hybrid learning models – who often and unintentionally talk about the work that they put into the enterprise – are among the least successful sales people for the new approaches. The reality is that universities are very resistant to change and will not quickly adapt to the new realities, even if economic circumstances suggest that new approaches are urgently required. A small percentage of faculty, enamored with the technologies or determined to better serve their students, will experiment with the technology and hybrid models, often in response to institutional grants and other incentives. Their impact is substantial but far from overwhelming. Universities are reluctant to change a system that serves faculty members well and that places the onus on students to adapt rather than instructors to adapt their course delivery to 21st century learning styles and opportunities.

3.6 What Role Does Remuneration of Faculty Play in the Development of New Educational Models?

One of the most prominent outcomes of the MOOC experiment has been the commercialization of content and the potential enrichment of innovative teachers. If one or more of the MOOC initiatives turns into the next Facebook or Google, producing one or more academic billionaires, we may assume that there will be a rush of intellectual entrepreneurs toward the prize of commercialization. At present, faculty members who invest time and effort in developing hybrid models might win a teaching award or receive a grant. They are unlikely to receive much of a salary boost.

The new learning models have the potential to share the course materials and teaching methods of a top teacher with hundreds of thousands of students. If a significant portion of the income from this exceptional work is shared with the instructor – as would be the case if she developed a newly patented idea or wrote a bestselling book – then faculty motivation might well grow. But is the university system ready to pay a superstar hybrid teacher $500,000 or even $1 million a year for a course that reaches around the world?

3.7 What Will Spark a True Revolution in University Education?

Universities are resistant to major changes and respond slowly to technological and pedagogical opportunities. There are already brilliant examples of advanced education innovation across the country, but few have taken hold. A real revolution could be sparked by an intense financial crisis. (We are actually in such a crisis now, but this is being managed by relying on sessional instructors and larger class sizes rather than rethinking core models.) The infusion of large sums of money could also help, although universities have the habit of using new funding to sustain current activities rather than to reinvent themselves. The disappearance of large numbers of students – to the work force, to other institutions, to alternate delivery systems – could and should generate new and creative thinking. Universities, however have grown incrementally, even in the face of dramatic pressures to expand, and will likely contract in a similar fashion if resources so dictate. The development of truly transformative technologies – meaning ones that appeal to teachers and that do not require an excessive amount of preparation by faculty members – could spark a revolution. To this point however, innovations have been incremental and marginal rather than transformative. Private and for-profit institutions operate with fewer constraints than public universities and they have the potential to lead the innovation revolution in advanced education. At present, they suffer from status envy and cannot compete in public profile and credibility with the top universities and, even, with publicly funded universities generally. Employers hold the key to radical changes in status and acceptability. If a set of 100+ employers were to signal their support for a particular model of alternative delivery by a private, for-profit supplier, there is a very good chance that ta sizable portion of the herd of career-seeking young adults heading to university would change their direction and head to the new system. The chances of this happening in conservative and government-oriented Canada are quite small. It is likely that other countries, likely starting in Asia, would be the first to take such an approach.

3.8 Is Life-Long Learning the Major Untapped Market?

Universities operate in commercial blocks that do not resonate with 21st century realities. Four-year degrees, year long "boot camp" masters programs, four month long courses (with around 40 contact hours), complicated degree requirements, and the like seem curiously out of touch with contemporary realities. Students, particularly mature and working people, have trouble finding the time to fit into standard university formats. At the same time, there is a great deal of evidence that adult learners are likely to be the major long-term market for advanced education, both of a general nature and more specialized learning tied to current or future employment. Hybrid models that combine personal contact with technology-mediated engagement are extremely well suited for a market that public universities have largely ceded to private sector service providers. Traditional academic units, as opposed to continuing education divisions, are not well suited to identifying and responding to such niche markets. In time, however, the upgrading imperative will likely drive innovation in this sector.

3.9 Is There a Hybrid-Based "Death Star" Model in the Offing?

In the end, one's views about the future of post-secondary education typically say more about the writer than about the evolution of the system. When correspondence courses were introduced, advocates spoke enthusiastically about how the educationally disadvantaged would flock to the new delivery model. The experience of Canada's online institutions suggests that this dream has not been realized. The mass proliferation of online courses across the world, likewise, was going to revolutionize post-secondary education, but the main result has been the growth of local and regional universities. MOOCs are supposed to be the trigger for a major revolution, but the initial hype seems misplaced. MOOCs require a high level of personal commitment and academic determination. There are thousands of such students around – and the stories are already circulating about the underage genius from India who completes Ivy League MOOCs. But the MOOC is, in the end, an academic elite solution that seems to be aimed at non-elite students. Smart, highly motivated, curious learners are drawn to MOOCs like bees to a field of fresh clover. Unmotivated, uncurious and poorly prepared students will stay far way from any delivery system that requires a high level of self-control and self-direction.

So, if not online courses and not MOOCS, what is the "death star" that might threaten the viability of traditional university education? The short answer is that no one knows for sure. Consider, however, the following scenario.

- A major, high quality Canadian university – let's use McGill as a possibility – decides to establish itself as a major educational force across the country. (The model works better with a global top five university – Harvard, Oxford, MIT -- than with a very fine Canadian institution.)
- The university sets up mini-campuses in cities across the country.
- They set up a small teaching centre, with four high end video-conferencing units connected to the classes offered by leading teachers at the home campus and supported by high quality online supplementary materials.
- The university recruits only the very top students from the local community – perhaps 100 to 150 in total, with the consequential impact on the local universities and colleges, and charges them a substantial

tuition fee for the opportunity, the cost of which is largely offset by the ability to live at home instead of relocating to Montreal).

- The university goes to the local campus and hires 5 or 6 of their elite teachers, who will provide local instruction, mentoring and program supervision.
- The university replicates this model in 50 communities across the country and in another 50 communities around the world.
- This initiative will raise the profile of the university nationally and internationally, draw the very best students from across the country.
- The system will produce sizeable revenues for the university, driven largely by the economies of scale possible through the use of hybrid technologies.

Will this work? It is difficult to tell, of course, and several institutions will try several models such as this before one succeeds. When one works profitably, the highly imitative global universities will move quickly replicate the proven systems. There are, of course, many other possible "death star" models but not much in the way of experimentation beyond the new found enthusiasm for the MOOCs.

4 Final Thoughts

Hybrid education is an important part of contemporary post-secondary education and has the potential to play an even more critical role in the future. The university system is slow to change and has been reluctant to respond to the potential of technology-mediated education. At the same time, the advent of the digital generation, with learning styles, attitudes toward expertise and assumptions about career-ready education largely shaped by technological engagement, is putting great pressure on universities to adapt to new realities. It is not clear that publicly funded universities can rise to the challenges. It is possible that major shocks will force a reoriented of university education, but steady decline is more likely than catastrophic failure. Most importantly, the investment in hybrid education is current – at least in part – a solution without a problem. The challenges facing universities, which largely have to do with student motivation preparedness, work ethic and curiosity, will not be solved by strategies designed for elite students and accessibility. In sum, the effort to develop and improve hybrid education needs to be connected to the serious and systematic problems facing the contemporary university system. At this point, this effort is not yet fully underway.

Getting Japanese Students to Engage in an Online Discussion Forum

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Abstract. Recently discussion boards have been widely used in Japanese tertiary institutions as educational tools to assist students to communicate with each other online. The system is also effective for the instructor in encouraging students to fully participate in classroom activities. Although the asynchronous approach provided by discussion forums has been developed and integrated into courses in Japanese educational settings, little research has been conducted regarding how novice users perceive the use of this technology. This study examines Japanese undergraduate students' perceptions of using discussion forums in a collaborative writing task. In addition, it looks at the benefits and drawbacks of this technology for maximizing their English study. Based on a semester-long empirical data study of the students' use of online discussion forums in a Hybrid Learning Course, their perceptions about the integration of forums have been examined. The results suggest that the students enormously benefited from online discussion forums such as improving critical thinking and problem-solving skills, as well as taking more responsibility for the writing process.

Keywords: online discussion forums, language study, learner's perceptions.

1 Introduction

In the recent years computer-mediated communication has been integrated into the tertiary education to improve student learning in a hybrid learning environment throughout the world [1-2]. As Markel claims, this recent adoption assists students to "work together on projects in small groups and participate in on-going discussions" [3]. This online communication is also helpful for students who feel isolated in online environments. Therefore, this new approach complements and fosters the implementation of face to face classroom activities [4]. One of the computer-mediated communication systems includes an online discussion forum which allows participants to post comments & questions as well as respond to messages individually [5]. The forum helps students become more involved in small discussion groups within a large classroom. Online discussion forums assist "peer revision and other collaborative methods in composing" and encourage learner-centred learning approaches [5]. Because of these various benefits, adopting online discussion forums for large classes has been an emerging trend [6]. A great deal of research has

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 10–20, 2013.

suggested that online discussion tools can be useful tools in the classroom [5]. However, there is still little research addressing how online discussion forums can be optimized so that students can gain considerable insights into what they learned in the classroom.

In the writing courses, traditionally, the focus is on the final product. The instructor's role is to correct errors in students' final drafts of writing, at the same time, paying careful attention to proper grammar points, spelling and punctuation. It is also true that students individually work on their writing tasks both inside and outside of the classroom in unsupported conditions [7]. In Asian educational settings, the "process writing approach" has been regarded as impractical and often too time-consuming [8]. One of the major reasons for this negativity has resulted from the fact that students are often neither independent nor self-motivated to write in the classroom [9]. In order to offer more flexibility in teaching and to improve the quality of writing courses, a writing course which encourages students to engage in active writing processes and to take responsibility for the writing processes which involve brainstorming, drafting, revising and editing [10-12] has been viewed as ideal. The instructor should develop teaching methods which enhance students' active involvement of writing.

2 Purpose of the Study

The purpose of this study is to examine Japanese undergraduate students' first experience using the discussion forum in order for them to improve their English writing skills successfully. The focus was placed on the benefits of using an online discussion tool viewed by individual students in a writing course.

2.1 Research Questions

1. How do students perceive using an online discussion forum in a process-oriented writing course?
2. What are the relationships between the students' views and sociocultural backgrounds, such as aims of study, and their perception of using an online discussion forum?

3 Methodology

3.1 The Setting and Student Profiles

The subjects of this study were 24 lower intermediate learners of English enrolled in a university English course. The study consisted of 21 male and 3 female full-time students, 18–22 years old. These students included those who studied architecture and those who studied electronic and information technology. The course was a two-semester Hybrid Learning course consisting of an instructor-directed, face-to-face learning environment and an online environment. The objective of this course is to help students develop their English writing and communication skills. They had attained at least a lower-intermediate level of English proficiency and were accustomed to teacher-centered language learning in a large lecture-type classroom. The writing experiences in the secondary school were examination-oriented. The student survey carried out during the course indicated that 83% of the students had advanced computer skills. The majority of students (79.2%) had no previous experience using online discussion forums. The majority of students (87.5%) had no experience of peer editing in the language classroom. 91.7% of the students had no experience using online discussion forums for peer editing. This course was offered weekly for ninety minutes in a computer classroom. Although only a few students had experience with online discussion, they possessed sufficient computer literacy and knowledge of Web browsers to be able to use the discussion forums.

3.2 Procedures

The project described in this study was divided into three stages: Pre-writing, Revising and Post-writing. In the first stage, students were required to write a script for a presentation with a topic provided by the instructor. The students were allowed to spend a lot of time jotting down all the ideas, composing them clearly and writing the first draft. In order to integrate a writing process meaningfully with their online discussion, students were instructed to consult dictionaries and other online sources to gain some knowledge necessary to write about his/her topic. On the completion of writing the first draft, the students were required to upload the file via a learning management system called GOALS. In the second stage, the students, divided into small groups, were encouraged to examine the content and the organization of other students' first drafts and make comments on them. At the beginning of this revising stage, the instructor demonstrated to the students how to use and navigate the online discussion forum. The focus of the revising process was placed on the logical argument in the text and overall organization of ideas. Based on the comments and feedback given by other students, students rewrote and finalized the draft. In the third stage, students made a presentation using their revised draft, followed by a question and answer session. Before the presentation, the instructor gave students guidelines in the form of a handout expected to prove useful for students to make a successful presentation. At the end of the course, students were provided with a questionnaire which attempted to attain feedback on their perceptions of the online discussion forum. The questions are listed in Table 1.

These questions had a 10-point Likert scale, with "1" representing "strongly disagree" and "10" representing "strongly agree". The remaining questions offered option selection questions. The questionnaire also had an area in which students were asked to write down their opinions on any aspect of the course. This survey was administered in a paper version and the questionnaires were written in Japanese in order for students to fully understand the questions. The points were totaled and averaged, and a standard deviation was also attained. The data is presented in this paper as mean ±SD. In addition, the results of students' ratings were analyzed by using Spearman's correlation to determine correlations between responses and significant factors underlying their responses. Correlation is judged as significant at the .01 level (2-tailed).

Table 1. Student views regarding the use of the online forum

1. Online discussion system was user-friendly.
2. Giving comments to other students was easy for me.
3. Online discussion built a sense of camaraderie.
4. Students' comments assisted me in revising my draft.
5. Online discussion encouraged good teamwork and communication among students.
6. Students' comments were more useful than the instructor's comments.
7. I wish I could have more comments from the instructor rather than other students.
8. Proofread by the instructor is better than proofread by the students.
9. Proofreading via online discussion is more enjoyable than proofreading by myself.
10. Proofreading via online discussion is more efficient than proofreading by myself.
11. Online discussion assisted students to build a tight social network.
12. Online discussion encouraged students to understand the importance of students' support.
13. Students' comments were very helpful.
14. Expressing my own opinions via online discussion was easier than expressing them face-to-face.
15. Students' comments were constructive and helpful.
16. I proofread other students' drafts appropriately.
17. I got back to other students' comments and inquiries promptly.
18. Engaging in online discussion was like playing a game.
19. I was able to study English successfully via online discussion.

3.3 The Online Discussion Forum

In the present study, an online discussion forum was easily accessible from a Learning Management System, called GOALS. The forum enables students to initiate or respond to messages that were accessible by simply clicking on a button. It was also designed for the instructor to join the forum.

After the login page, students are directed towards the 'A list of discussion groups' page, as illustrated in figure 1. Here, students are presented with a list of groups with assigned members. A group column enables students to access an assigned discussion group provided by the instructor. The discussion group can be easily duplicated from one course to another.

Fig. 1. Discussion groups with assigned students

Fig. 2. GOALS discussion forum

Students are then guided to a page where they were advised to post their responses to or comments on the group members' postings (see figure 2). On the left side of the list is a discussion forum where students communicate with each other. From here the students can download the materials uploaded by other students. This page also assists students in communicating with the instructor who reads and comments on students' inquiries. For example, if a student finds it difficult to revise his/her draft, the instructor may provide the student with suggestions and ideas for dealing with the problem.

4 Findings

The results gained by the questionnaire are presented below. As shown in Figure 3, with regard to the students' views on GOALS discussion forum, almost all the students thought the system was 'user-friendly' and 'easy' to use. On the other hand, it is interesting to note that there were only a few students who thought the forum was 'necessary' and 'important' for their study. There were only a few students who thought the discussion forum was 'interesting'.

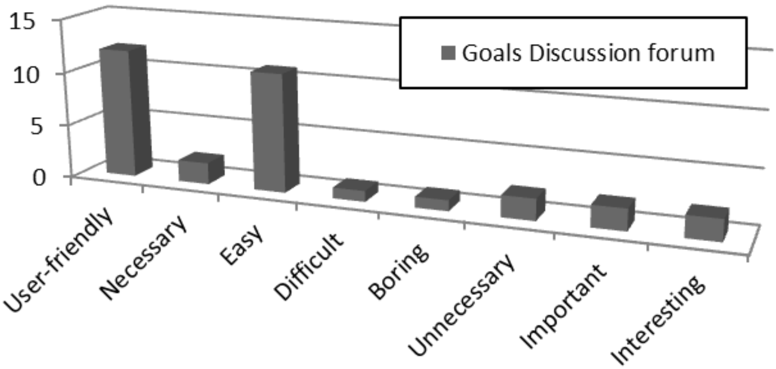

Fig. 3. Students' views on GOALS discussion forum

Table 2 shows that there was a moderate correlation (r < .6) between those who thought that the discussion forum was user-friendly and those who thought that giving comments to other students was easy (r = .779, $p < .01$). There was a moderate correlation (r < .6) between those who thought giving comments to other students was easy and those who thought the discussion assisted students to build a tight social network (r = .544, $p < .01$). In addition, there was a moderate correlation (r < .6) between those who thought that the discussion assisted students to build a tight social network and those who thought other students were helpful (r = .595, $p < .01$).

Table 2. Correlation between factors regarding online discussion and comments

	Online discussion forum was user-friendly.	Give comments to other students was easy for me	Online discussion assisted students to build a tight social network.	Students' comments were very helpful.
Online discussion forum was user-friendly.	1.00	-----	-----	-----
Give comments to other students was easy for me	0.779**	1.00	-----	-----
Online discussion assisted students to build a tight social network.	0.444*	0.544**	1.00	-----
Students' comments were very helpful.	0.559**	0.650**	0.595**	1.00

*Notes: Correlation Matrix (N = 24), **p* < .01, **p* < .05

Table 3 shows that there was a moderate correlation (r < .6) between those who thought the discussion built a sense of camaraderie and those who was able to

Table 3. Correlation between factors regarding online discussion, proofreading and comments

	Online discussion built a sense of camaraderie.	I proofread other students' drafts appropriately.	I got back to other students' comments and inquiries promptly.	Engaging in online discussion was like playing a game.
Online discussion built a sense of camaraderie.	1.00	-----	-----	-----
I proofread other students' drafts appropriately.	0.640**	1.00	-----	-----
I got back to other students' comments and inquiries promptly.	0.716**	0.762**	1.00	-----
Engaging in online discussion was like playing a game.	0.470*	0.612**	0.558**	1.00

*Notes: Correlation Matrix (N = 24), **p* < .01, **p* < .05

proofread other drafts appropriately (r = .640, $p < .01$). There was a moderate correlation (r < –.6) between those who proofread other drafts appropriately and those who got back to other students comments and inquires promptly (r = –.762, $p < .01$). The correlation of .716 was also significant between those who thought the discussions built a sense of camaraderie and those who got back to other students' comments and inquires promptly.

As shown in table 4, there was a moderate correlation (r < .6) between those who thought expressing opinions via the discussion forum was easier than expressing face-to-face. (r = .566, $p < .01$). There was a moderate correlation (r < .6) between those who thought that expressing opinions via a discussion forum was easier than expressing face-to-face and those who studied English successfully via the discussion forum (r = .790, $p < .01$). The correlation of .401 was also significant between those who thought students' comments were constructive and helpful and those who studied English successfully via the discussion forums.

Table 4. Correlation between factors regarding online discussion

	Expressing my own opinions via online discussion was easier than expressing face-to-face.	Students' comments were constructive and helpful.	I was able to study English successfully via online discussion.
Expressing my own opinions via online discussion was easier than expressing face-to-face.	1.00	-----	-----
Students' comments were constructive and helpful.	0.566**	1.00	-----
I was able to study English successfully via online discussion.	0.790**	0.401	1.00

*Notes: Correlation Matrix (N = 24), **p* < .01

The students expressed distinct but different opinions about the discussion forum. Some students commented favourably about the system as follows.

> "My friends found passages that were difficult to understand and I was able to clarify those parts at anytime, anywhere, even at home."

> "Online discussion was fun. I've never experienced such an enjoyable experience in my previous English courses before."

> "The comments I received from other students were very helpful and constructive. I was able to revise my paper based on these comments."

> "Although the discussion forum was a bit difficult for me at the beginning, I realized that the feedback I received from other students allowed me to look at my paper with fresh eyes."

> "Even something I hate to say face-to-face I was able to express without hesitation,."

On the other hand, there were students who made negative comments about the discussion forum as follows.

> "I wish I was better at English, so to give more easily understandable constructive criticism or praise to other students."

> "I don't really think that the online discussion forum was necessary for revising my paper."

5 Discussion and Conclusions

The project in the present study was carried out in an experimental setup and the sample size is too small to allow any generalization. However, the data collected from the questionnaire and the interviews offered several pedagogical implications regarding the future implementation of online discussions. One of the major findings from the survey indicates that, even though the students were novice online discussion users, the majority of them had positive attitudes towards the discussion forum. The feedback and responses from other students via the forum increased student motivation for writing [13]. They also assisted students in evaluating what they wrote critically [14]. Although the discussion was not structured and cohesive, the students were not skeptical about relying on feedback from other students. In addition, the survey indicates that the three stages in this course encouraged students' active participation in the writing processes. As Cotton suggests, the three stages encouraged students to gain "the ability to monitor and correct their own writing as well as that of their classmates" [15]. The findings suggested that the process encouraged students to become both a reader and a writer of a text [15].

Another finding includes the fact that the collaborative activities assisted students to organize an essay more effectively and efficiently without feeling unsupported. It is obvious that the students in the same group felt a sense of community and this eliminated the fear of being left alone during the writing process. The process of engaging students in online interaction reduced students' anxiety of being unable to write grammatically correct passages. Considering Japanese educational settings where people have been trained to be modest and not to show off, it was surprising that the students didn't show reticence towards communicating with other students.

Making a presentation assisted students in sharing their writing with other groups, and feedback from the floor encouraged them to reflect on their own work. It can be concluded that the students in the online discussion forum easily accepted the implementation of the forum as they were satisfied with the "open, flexible delivery mode" of this learning type [16].

On the contrary, a careful examination of the findings also indicated that there were a few students who had negative attitudes towards the forum. Some students stated that the online discussion forum was time-consuming and laborious. These students were not willing to "construct knowledge through the shared experiences that each participant brings to the collaborative discussions" [3]. The findings of the present study suggest that the instructor should determine the online discussion's pedagogical impact upon students. The instructor or administrators should not regard a discussion forum simply as a tool for students to communicate asynchronously. It is important for the instructor to develop an environment where students become actively engaged with the course content and negotiate the meanings through the interaction with other students [3]. In order for the instructor to encourage students to make the maximum use of discussion forums, the focus of attention should be on shifting from traditional teacher-centered classrooms to learner-oriented online environments [17]. Further research with a larger sample size should be conducted to acquire a more comprehensive understanding of educational benefits provided by discussion forums. This will assist students to increase their motivation and develop a sense of responsibility in online environments.

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A Case Review on the Implementation of Intelligent Tutoring Systems on Mobile Devices

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Abstract. An Intelligent Tutoring System (ITS) is characterized by its provision of customized and immediate instructions to students. This paper reviews the development of a Sudoku ITS on mobile devices, with a focus on the technical challenges and students' experience. It is revealed that, although mobile devices offer the flexibility of learning anywhere and anytime, the small display and limited processing power and storage pose the challenges on algorithm design and user interface design. To address these challenges, a thin client with a neat user interface, connecting to an external database is used. The Sudoku ITS has received positive feedback from students. The customized and immediate instructions could effectively help students acquire skills and develop strategies in puzzle solving. It is suggested to make adjustments on the threshold of auto-instruction to cope with the needs of experienced players.

Keywords: Intelligent Tutoring System, Mobile Learning, Sudoku.

1 Introduction

An Intelligent Tutoring System (ITS) is broadly defined as any system that provides customized and immediate instructions or feedback to students [1]. Its predecessor is known as Computer Aided Instruction (CAI), which aims to support learning by encoding sets of exercises and the associated solutions, and by providing predefined remediation actions when learners' answers do not match the encoded solutions [2]. Starting from early 1970s, researchers began to integrate concepts of artificial intelligence, psychology and education into CAI in order to provide more intelligent, dynamic and tailored-made instructions to students. This became the early form of ITS. Different from CAI, ITS predefines neither the possible solutions to a specific problem nor the corresponding instructions in response to certain student input. It checks the students' solution real-time, evaluates the students' understanding on the target area and provide adaptive instructions accordingly.

A typical ITS consists of four components, namely, an expert model, a student model, a tutor model and a user interface, as shown in Fig. 1. According to Nwana,

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the expert model contains facts and rules on a specific topic to be learned by the students [3]. The student model keeps track of student information, including their background, their knowledge on the topic, their performance and other information such as their emotional state. The tutor model responds to student input through the user interface and gives adaptive instruction to the student, based on the knowledge in the expert model and the information in the student model.

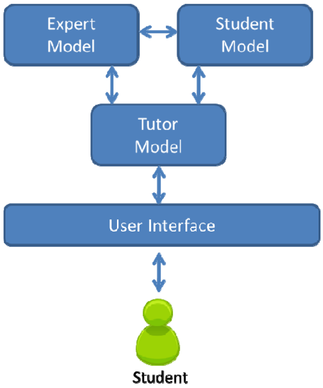

Fig. 1. A typical Intelligent Tutoring System.

In the past decade, with the advent of new mobile devices with sophisticated functional features and the popularity of wireless networks, student became adapted to mobile learning. Mobile learning can be defined as any sort of learning that happens when the student is not at a fixed, pre-determined location, or learning that happens when the student takes advantages of the learning opportunities offered by mobile technologies [4]. It transforms the learning process and change the ways of learning, offers flexibility in learning and expands learning experience in terms of time and place [5]. From the techno-centric perspective, mobile learning is viewed as learning through mobile devices, such as personal digital assistants, mobile phones, smart phones, tablet devices and notebook devices [6]. Obviously, mobile devices are the essential tools to enable mobile learning which emphasizes learning anywhere and anytime. To take the advantage of this flexibility in learning, ITS on mobile platform, or mobile ITS, has become one of the developing areas of ITS [7, 8].

Whilst mobile ITS offer clear advantages on the flexibility of learning anywhere and anytime, there are technical limitations such as on screen size, navigation method, processing power and storage space. A number of technical challenges have to be tackled in order for an ITS to be implemented on mobile devices. Like many mobile applications, usability is always a concern for any mobile ITS. Given the flexibility of learning anywhere and anytime, it is important to evaluate the learning effectiveness and students' satisfaction for mobile ITS.

This paper reviews the implementation of ITS on mobile devices, using a typical Sudoku game. We propose a Sudoku ITS which provides adaptive instructions, based on the current game state and the player's level of expertise, learning preference and performance in the game. As logical thinking ability can be improved by experience, examples and instructions as long as people are conscious of the fact that they are using logical principles [9], the Sudoku ITS would contribute to the development of students' logical thinking ability. However, in this paper, our focus is placed on the technical challenges of the system development and the learning experience of students.

The rest of this paper is organized as follows. Section 2 is a brief overview of Sudoku game and the terminologies used in this paper. Section 3 describes the development of a Sudoku ITS on mobile platform, where the technical challenges are highlighted. In Section 4, the learning experience of students is reported and discussed. Section 5 briefly concludes this paper.

2 An Overview of Sudoku

Sudoku is a number-based logic game that has become a world-wide hit in recent years. A Sudoku puzzle is a 9 × 9 grid with some given numbers from one to nine. The rule of the game is simple: to fill in numbers from one to nine so that there is no duplicate numbers in each row, each column or each 3 × 3 sub-grid.

In recent years, researchers have discovered the potential use of Sudoku in dev eloping players' logical thinking ability [10, 11, 12]. As a type of logical thinking, logical deduction refers to the reasoning process to derive a conclusion from a set of accepted premises [13]. When playing a Sudoku game, a player need to apply different Sudoku strategies which are in fact logical deductions in which the premises are the existing numbers in a puzzle and the game rule, and the conclusion to reach is the correct value that an unsolved grid should hold. Traditionally, people learn Sudoku strategies by experience or by reading relevant materials, which causes the isolation between instructions and the learning environment and thus is not very efficient or effective.

Figure 2 shows the Sudoku terminologies to be used throughout this paper. The 9 × 9 grid of Sudoku game is called a game board. A single grid is called a cell. A cell with a value is called a determined cell while a cell with no value yet is called an undetermined cell. A horizontal collection of nine adjacent cells is a row and a vertical collection is a column. A 3 × 3 sub-grid is called a block. Any row, column or block is called a house. Numbers that are given at the beginning of the game are called clues. A correct answer to a cell is called a definite value. A definite value becomes a clue when it is filled in a cell. Possible values for an undetermined cell are called candidates.

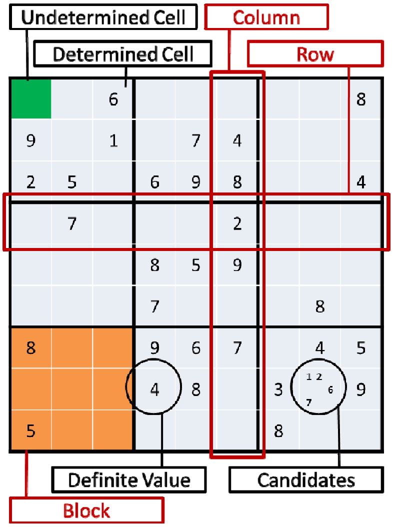

Fig. 2. Sudoku terminologies

3 Sudoku ITS on Mobile Devices

This section describes how the Sudoku ITS can be effectively implemented on mobile devices. It begins with elaborating the technical challenges on algorithm design and user interface design. Pinpointing these technical challenges, a thin client with a neat user interface, connecting to an external database is proposed. The design of user interface and the design of a cognitive rule-based expert model, student model and tutor model would be elaborated.

3.1 Challenges of ITS on Mobile Devices

ITS on mobile platform, or mobile ITS, offers many advantages. First, it takes the advantage of short periods of time called micro-breaks [14], which allows learning to take place at anytime convenient for a user. Second, ITS on mobile platform is no longer restricted to a fixed position as traditional ITSs on desktop computers. Third, ITS on mobile platform can help schools with limited computing resources [15] to provide one-to-one tutoring as cognitive studies have shown that one-to-one tutoring advances student learning efficiency four times faster than that of traditional classroom learning [16].

Implementation of ITS on mobile devices poses a number of technical challenges. An obvious challenge is to display a large amount of information on a much smaller size-screen compared with desktop computers. Merely reducing the font size and the object size makes the reading experience uneasy. One way to address this problem is to develop a multi-tab interface allowing users to switch between pages for different information at the expense of increasing navigation effort [17]. Another way is to include all essential elements in one single screen so that users do not have to navigate back and forth, but this will cost more design effort.

Another challenge related to user interface is that finger-touching interactions between a user and an ITS are limited by the small-size keyboards and buttons on mobile platform [18]. This means that activities requiring a large amount of user inputs should be avoided in order to ease human-machine interaction. Apart from the user interface issues, limited computing power decides that all algorithms embedded in an ITS have to be efficient to provide a smooth user experience.

Owing to the fact that mobile ITS can make use of micro-breaks, It is required that each tutoring session should be designed in a way that users can finish it in a short period of time or that it can be completely resumed for users to continue next time [18]. This adds complexity in the technical design.

3.2 Technical Design of the Sudoku ITS

To address the above-mentioned challenges, it is proposed to adopt a thin client on the mobile device with a neat user interface, connecting to an external database via a web service page. There are two key components, namely, the Sudoku ITS application on mobile devices, and an external MySQL database for keeping records of all registered players for analysis. Both are connected through a web server. Fig. 3 shows the system structure.

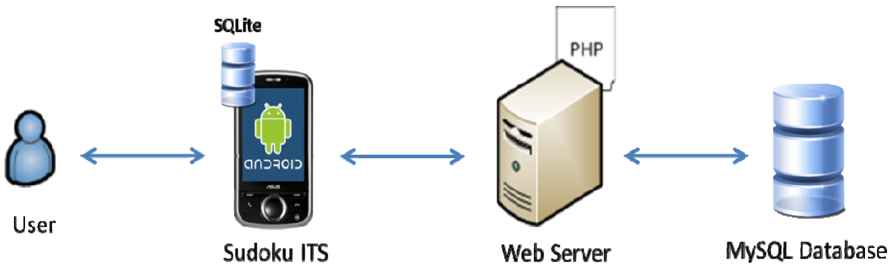

Fig. 3. Structure of the Sudoku ITS

The Sudoku ITS was developed using Java. An embedded light-weight database in Android devices, called SQLite, was used to store information needed during the tutoring. A web service page written in PHP was put on the web server which served as a bridge between the Sudoku ITS on mobile devices and the MySQL database. The Sudoku ITS adopted the classical architecture of ITS [19, 20, 21] which consists of an expert model containing domain knowledge including all Sudoku strategies to be learned by a student, a student model containing information related to each student's learning and a tutor model which generates and delivers adaptive instructions.

Interface Design

The game page is the user interface of the Sudoku ITS, as shown in Fig. 4. A neat user interface, where all essential elements are shown in one single screen, is adopted. This eliminates the need of navigating screens back and forth, but more design effort has to be made. The upper part of the page contains a Sudoku game board with nine number input buttons. All the instructions are displayed in the lower part of the page, and two buttons are used to switch on or off the pencil-mark input mode and request instructions respectively. A timer is placed in the right bottom corner of the page to time a puzzle.

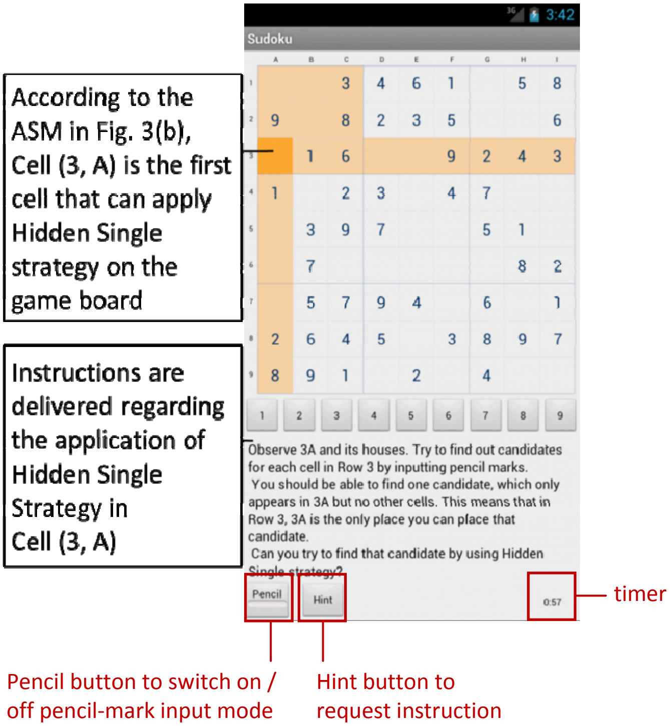

Fig. 4. Game Page of the Sudoku ITS

Expert Model

The expert model is constructed based on the adaptive control of thought – rational cognitive theory, presuming the cognitive skills of human beings can be represented by condition-action pairs stating that an action should be taken if certain precondition is satisfied [22]. The expert model also keeps track of the current game state including clues on the game board and candidates for each undetermined cell and determines applicable strategies to each undetermined cell. Clues are stored in an array data structure. As for candidates and applicable strategies, we adopt the methodology by Caine and Cohen [23], using a Candidate Matrix (CM) to represent candidates for each undetermined cell and an Applicable Strategy Matrix (ASM) to denote what strategies can be applied to each undetermined cell, as shown in Fig. 5.

	A	B	C	D	E	F	G	H	I
1	7	2					9		
2		4					1	7	
3	57			8	78				
4		8			589			6	9
5	46				8	268			4
6	456		5	16	159	6	39		
7	3					8		23	
8					1				
9					6	67		3	5

	A	B	C	D	E	F	G	H	I
1	2	2					2		
2		2					2	2	
3	3			2	3				
4		2			3			2	2
5	5				2	3			2
6	35		1	3		2	3		
7	1					2		3	
8					1				
9				2		3		2	2

Fig. 5. (a) Candidate Matrix, and (b) Applicable Strategy Matrix

CM is basically a data structure in which each cell on the Sudoku game board is given a unit of space to store its candidates. For example, Cell (3, A) in Fig. 5 (a) can accommodate two candidates: 5 and 7. ASM has a similar data structure as CM where each unit of the matrix contains the index numbers of strategies that can be applied to a cell. For example, Cell (3, A) in Fig. 5 (b) can apply one strategy with index number 3 representing Hidden Single strategy. Applicable strategies are derived by comparing the current state of each undetermined cell with the preconditions of the production rule of each Sudoku strategy. If the current state of a cell matches the precondition of a strategy, that strategy can be applied to the cell.

Student Model

The proposed Sudoku ITS implemented a simple student model which tracks the student's Sudoku experience (i.e. the number of times that a student has played Sudoku) and updates the student's level of expertise in Sudoku. Four levels of expertise naming naïve, beginner, intermediate and advanced are assigned based on a student's Sudoku experience. The more experience the student has, the higher level of expertise is assigned. When users start the system, they will be asked to enter roughly how many times they have played Sudoku in the past and this becomes their initial level of expertise. As users finishes more games, their Sudoku experience and level of expertise are updated in the student model accordingly.

Tutor Model

The tutor model is in charge of all instructional activities between the ITS and a student [24]. The foundation of the tutoring functions lies in the teaching strategies embedded in the tutor model. Teaching strategies refers to the tactics and techniques used in teaching. They can be obtained mainly by means of observing human tutors, deriving from existing learning theories and experimenting with real students [25].

In the proposed Sudoku ITS, we mainly embedded three teaching strategies, namely, mix-initiative interaction, learning preference and multi-level instructions. The tutor model initiates an interaction by providing auto-instructions to a student when it detects the student's bottleneck in puzzle solving. The indicator in the detection of bottleneck is the time interval between the student's last action and current time. If the time interval exceeds a certain threshold, the tutor model will consider the student to be having difficulties and provide auto-instructions. The auto-instruction threshold is assigned based on the student's level of expertise and the level of difficulty of the puzzle. There are possibilities that the tutor model cannot detect the student's bottleneck. Under such situation, students can initiate an interaction by pressing the hint button and receive instructions immediately.

Learning preference is set by a student before playing a game by indicating one strategy as the learning objective of puzzle solving. As a result, the tutor model delivers instructions on this prioritized strategy first if there is a cell on the game board that can apply the prioritized strategy. If not, the tutor model will provide instructions on the first strategy it finds that can be applied to a cell on the game board.

The tutor model adopts a 4-level instruction mechanism. The lower the level, the more detailed the instruction. The tutor model determines the level of instruction to be provided for a target cell based on the student's level of expertise, the number of times the hint button being pressed, and the number of times the tutor model having automatically provided instructions for the target cell. The higher the student's level of expertise in Sudoku, the less detailed the instruction will be, which gives the student more space to solve the cell on his/her own. The more times the tutor model has provided instructions on a cell, the more detailed the instruction will be. Because if a student constantly requires instructions on the same cell, it means that previous instructions might not be detailed enough for him/her to solve the cell.

General Workflow of Instruction Delivery

The Sudoku ITS starts with displaying the Sudoku puzzle. The expert model generates the CM, while the tutor model sets auto-instruction threshold based on the user's level of expertise and the level of difficulty. During the game, the tutor model monitors the user's performance and delivers instructions if the hint button is pressed or the user's idle time exceeds the auto-instruction threshold. To deliver an instruction, the tutor model first checks the ASM and finds the first cell it encounters that can apply Hidden Single strategy, assuming that the user has set his/her learning preference to be Hidden Single strategy. As a result, it finds Cell (3, A). It then decides the level of instruction based on the user's level of expertise in Sudoku and the times that it has provided instructions on this cell. Finally the tutor model generates the wordings of the instruction based on data stored in the CM. Every time a user inputs a correct value for a cell, the expert model updates the CM and the ASM accordingly. At the end of the game, the student model updates the user's level of expertise.

4 Students' Learning Experience

We conducted a preliminary test with 10 students aging from 18 to 30, including 1 student in pre-college program and 9 students in graduate school. Two of them are experienced Sudoku players who had played Sudoku as a hobby for a certain period of time. The other eight are players at beginner level who have not played or have only played a few Sudoku games before the test. Each student was asked to solve two Sudoku puzzles at normal difficulty level with Naked Single strategy as learning preference on mobile devices. We observed the students' behaviors during the games. The students were asked to express thoughts regarding their gaming experience while they were playing. After finishing two puzzles, the students were interviewed about their overall experience with the Sudoku ITS. Students' performance data of each Sudoku puzzle were collected including total time used, the total number of incorrect answer and time used, strategy used and the number of hint requested for each input answer. The results of the preliminary test are highlighted as follows.

Feedbacks from the Students

All the 10 students agreed that the interface of the Sudoku ITS was easy to navigate. In terms of the tutoring functionality, four of the students did not use any instruction at all including the two experienced players. The other two of them took advantage of the system's response to an incorrect answer (the system would give a message saying "Try again" once a student input an incorrect answer) and finished the game by guessing. Among the other six students who used instructions, all of them thought that instructions were useful in puzzle solving and in helping them out when they were stuck. Five of them also thought that they learned new Sudoku skills through instructions and felt more competent in Sudoku after playing. Two of them believed that instructions helped them to develop their own strategies in solving Sudoku such as starting with places with more clues.

On the other hand, problems were revealed in the preliminary test. Two students found auto-instructions disturbing when they were focusing on solving a cell by themselves. One student thought that auto-instructions make her feel under pressure. Three students felt the instructions were too long, which discouraged them from reading instructions.

Students' Performance in Puzzle Solving

Apart from the students' feedbacks on their Sudoku ITS experience, we captured other information related to students' performance in puzzle solving. For each puzzle solved by each student, we recorded the number of wrong answers input by the student, total time used to solve a puzzle, time intervals between steps (i.e. how long it takes a student to input an answer), Sudoku strategies used for each step and the number of hints used by the student. The information serves as indicators of each student's progress in Sudoku learning. They allow us to evaluate students' performance and adjust instruction provision accordingly.

The following are criteria that we think how these indicators may potentially reflect a student's learning.

- An increase in the number of wrong answers input by a student may indicate that the student has misunderstandings or has encountered problems during a puzzle. So the threshold for providing auto-instructions can be tuned smaller in order to give the students more help and the level of instructions provided should be lower so that more details on the explanation of current game situation are given to the students.
- A decrease in total time used in finishing a puzzle may indicate an advance of a student's Sudoku expertise. Accordingly, in the tutor model, the threshold for providing auto-instructions can be tuned larger to give the student more independency and the level of instructions can be higher which means that they contain less details. Recording time intervals between steps allows us to generate a curve of the student's Sudoku solving speed. A negative value of the slope may indicate a rise in a student's Sudoku skills because the student can make a step faster and faster.
- Sudoku strategies used for each step helps us to understand a student's mastery of each strategy. The more a student uses a strategy, the more familiar he or she is with this strategy. We also keep track of the number of hints used by a student including those automatically provided by the system and those requested by the student by pressing the hint button. This gives us clues on how much help the student needs from the system. Within one single puzzle, a lower number of hints used may reflect a higher proficiency in Sudoku of a student. As for the number of hints used across consecutive puzzles, a drop may indicate that the students is making progress in Sudoku skills because he or she requires less help from the system.

Learning Effectiveness of the Sudoku ITS

The preliminary test results showed that the Sudoku ITS is effective in teaching and learning Sudoku, especially for beginner level players. The instructions provided by the system were successful in facilitating puzzle solving, teaching Sudoku strategies and helping develop Sudoku skills. Besides, the information on students' performance in puzzle solving (such as the number of wrong numbers input, total time used, and time intervals between steps) also provided useful indicators for evaluating students' performance and adjusting the instruction provision.

On the other hand, we identified a number of areas for further improvement. First, the tutoring functions should be adjusted to cope with the needs of more experienced players. Second, the system should have the flexibility to allow students to turn auto-instructions on or off, to fit their personal preference. Third, the threshold of auto-instruction should be appropriately adjusted in order to avoid giving pressure to students. Fourth, the instruction delivery language can be further refined.

5 Conclusion

In this paper, we reviewed the development of a Sudoku ITS on mobile devices. The Sudoku ITS is able to provide adaptive instructions during a Sudoku game based on the current game state and the player's experience in Sudoku, learning preference and gaming performance. The Sudoku ITS can be used by individual players who want to learn Sudoku, to enhance Sudoku skills or just to play for fun as well as by instructors for teaching purposes. We describe how to implement Sudoku ITS on mobile devices, with a focus on resolving the technical challenges on the user interface design and the limitation on processing power and storage capacity. It is proposed to adopt a thin client with a neat user interface connecting to an external MySQL database via a web service page written in PHP. SQLite, a light-weight application in mobile device, was used to store information needed.

Another focus of this paper is on the students' learning experience. We presented a preliminary test with 10 students to collect their feedbacks and analyze their performance data in puzzle solving. Positive feedbacks were received, showing that the Sudoku ITS is effective in teaching and learning Sudoku. The system successfully facilitated the students in solving puzzle, learning Sudoku strategies and developing Sudoku skills. Besides, with the number of wrong answers input, number of requests of instruction, total time used, and the time intervals between steps, we can evaluate the students' performance and adjust the instruction provision accordingly. Finally, we suggested allowing the flexibility to make adjustments on the threshold of auto-instruction in order to cater for the students' learning difference and preference. Our study shows the challenges and promises of developing an ITS on mobile devices, and provides the Sudoku ITS as an example of such implementation. It is hoped that the findings of this paper can provide a useful technical reference for the development of ITS on mobile devices.

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Research on the Process of Collaborative Meaning Making in CSCL

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Abstract. Meaning making is the central to collaborative learning in CSCL and from socio-cultural perspective this process is a social and dialogical process. This paper proposes to use socio-cultural discourse analysis to study the process of meaning making. Based on a case study, the paper analyzes the group discourse on the group forum in Moodle system. The study shows that when group members participate in collaborative activities, they are engaged in different types of discourse and through these discourses, they share information, interpret ideas, explore the problem and negotiate meaning and finally reach the shared understanding. The group product emerged from their collaborative efforts.. The study proved that this method is effective in exploring the process of meaning making in CSCL environment.

Keywords: CSCL, meaning making, CSCL, Discourse analysis.

1 Background

Computer-supported collaborative learning (CSCL) is an emerging branch of the learning sciences and it is concerned with studying how people can learn together with the help of computers [1].Analysis of collaborative learning and computer support is the two main research themes. Koschmann's [2] description of CSCL can shed light on these two themes: CSCL is "a field centrally concerned with meaning and practices of meaning-making in the context of joint activity and the ways in which these practices are mediated through designed artifacts." From this definition, we can see the practice of meaning making is the research focus. In fact, experts[1] at the three international CSCL conferences all emphasized the centrality of the analysis of meaning making to the study of collaboration and proposed that analysis of meaning making should become the focus of collaborative learning research. Stahl [3] argued that because collaboration and collaborative learning take place through processes of shared meaning making, CSCL and CSCW must be concerned with the nature of meaning and social meaning-making practices. What is the nature of meaning making in CSCL? How do the group members make the shared meaning? How do researchers analyze this process? This paper will try to answer these questions.

2 Meaning Making: A Social and Discourse Process

CSCL takes a new constructivism and socio-cultural view of learning and it views learning is inherently a social, dialogical process in which learners benefit most from

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 33–44, 2013.

being part of knowledge-building communities both in class and outside of school [4], and Learning is highly social and culturally embedded. From socio-cultural theory, Learning first occurs in social interaction from the interpsychological plane and then to the intrapsychological plane with the assistance of knowledgeable members of the culture. And social constructionism holds the idea that Learning is the collaborative construction of a shared knowledge through contextualized discourse. The learning science also views learning as involving meaning making by the learners [1]. In CSCL learners negotiate meaning mainly through language and they engage in group dialogue to establish interpersonal relationship and common ground. Language plays a vital role in this social practice. It is through discourse that learners construct their knowledge, express their opinions, values and feelings. Actually it is through discourse that educators can observer the quality and direction of their learners' working and learning [5]. So examining their talk and text is crucial to get at how meaning is constituted locally, and how ‘knowledge’ and ‘knowing’ are jointly produced by teachers and learners. Stalh [3] argued that the practices of meaning making are acts of discourse or interaction; these discourses propose, negotiate, display and define what are to count as the salient features of the setting, the occasion, and the social norms. Sawyer [6] reviewed the relevant studies which focus on collaborative conversation and concluded that conversation is the place where group knowledge building translates into individual cognitive advancement and conversational interaction is the mediating mechanism whereby collaboration contributes to learning. That is why learning scientists have increasedly studied the discourse processes of collaboration- the turn-by-turn interaction patterns that occur among students in a group. So to understand the process of meaning making in CSCL, we need to focus on the discourse taking place in computer-mediated communication and by analyzing the discourse we can unfold the nature of meaning making.

In this paper I will employ sociocultural discourse analysis to study the process of collaborative learning in CSCL environment.

3 Discourse Analysis: A New Approach to Analyzing Meaning Making in CSCL

Discourse analysis first comes from linguistics and it is mainly concerned with describing linguistic structure. Later researchers from anthropology, sociology, psychology, communication, education, cognitive science and the learning sciences have developed different discourse analysis methods. Discourse analysis from socio-cultural perspective is appropriate for our analysis of meaning making in CSCL as it also comes from Vygosky socio-cultural theory. It conceives discourse to be interactional actions and lays stress on the social functions of language. From socio-cultural perspective, discourse is situated, action-oriented and constructed [7] and these features are the theoretical foundation for analysis. So we should select naturally occurring discourse in real world settings for analysis. The analysis should focus on the context, form, meaning and function of the discourse. As discourse performs actions, the researchers need to examine what the participants use language to do, how the meaning is constructed, what the language evidences are and what is related to research question. These questions can help the researcher to analyze the discourse in CSCL to explore the types of discourse, the function of discourse to see how learners negotiate the meaning, solve the problems and what role of discourse is in collaborative learning. I will present a case study by using discourse analysis to address these questions.

4 Case, Data Collection and Analytical Procedures

4.1 Case and Data Collection

From 2006 to 2008 I participated in a joint international educational research project "e-China-UK on intercultural professional development". This project involved intercultural collaboration between three UK universities and four Chinese universities and it aimed to provide a shared experience through discussing and experiencing e-tutoring, e-pedagogy, e-learning etc so that the teachers can share intercultural perceptions in dialogical and critical collaborative learning settings. The researchers and teachers from Sino-UK universities conducted three workshops to discuss the course development and collaboratively designed an intercultural online course in e-pedagogy. Then 40 teachers were recruited from 18 UK and Chinese universities and they were divided into 6 groups with both Chinese and British teachers in every group. The course was delivered via Moodle system and the 6 researchers participated in the group discussion as e-tutors to support and facilitate the group learning. The course lasted 12 weeks from October to December, 2006. The course consisted of induction and three units, and it adopted collaborative project-based learning. The group members first got to know each other and tried to build online community and then collaboratively decide a group topic or problem for further discussion. They needed to participate in the collaborative activities to explore the topic, to solve the problem and work out a group product.

As Moodle system recorded all the discourse occurring in group discussion and they were all kept in database. The researcher can observe, replay and unfold these data. To analyze the discourse, we need not transcribe the data. As the discourse in the group forum is public and visible and also shared by all the group members, it is easier for the researchers to examine the process of group meaning making.

4.2 Analytical Procedure

Doing discourse analysis is very much a practical skill, and, it is difficult to formulate the methods as a set of gradual procedures and techniques governed by a set of rules. Potter & Wetherell [8] proposed a ten-stage analysis of discourse. Based on their research and my research question, I developed a five-step analysis procedure [9]. First researcher needs to decide the research question, and select sample discourse session and then code the data. The purpose of coding is to put the unwieldy data into manageable chunks and it is a preliminary analysis getting some preparations for the later more intensive study of discourse. By coding, discourse researchers produce a body of relevant instances and put them into a number of different categories [8]. And then comes analysis step. The researcher's attention should be paid on the constructive and functional dimensions of discourse. To examine the discourse in CSCL, the researcher should focus on the six themes, that is **context, structure, function, interaction, meaning and mediating tools** in the discourse and try to find the language evidence to support your interpretation..

5 Results and Discussion

5.1 Types of Discourse in Group Discussion

By examining and coding the discourse data in group discussion, I identified the following five types of discourse.

a. Information sharing discourse. By this discourse, the learners share the resource and ideas and build a common ground for further discussion.

Let me share a few links that might be useful in working on the project…
Hello, I have added some ideas about how to evaluate the online behavior and how to collect the information of students' online behavior.

b. Exploratory discourse. The participants engage in exploratory discourse to ask questions, offer ideas, give the comments to explore the problem. This type of discourse usually involves asking questions.

Is there a difference…? How does general guidance on designing for learning map onto online learning? How do you get busy staff to use online learning with their students?

c. Negotiative discourse. When the learners negotiate the meaning, agree or disagree with others and modify the ideas, they are engaging in negotiative discourse. This type of discourse often builds on each other's ideas and has very striking constructive features.

Hello, everyone, can we all agree that we discuss online behavior in collaborative learning community and how to facilitate or promote collaborative learning? If we agree with that, can we brainstorm the topic and pose some specific questions and then each member chooses his/her interesting one for individual task?...

d. Integrative discourse. Online discussion can be divergent and multi-directional as the group members negotiate the meanings, so the main points need to be summarized to make the discussion coherent and to keep the topic on track.

Hello everyone, based on what we have discussed and we have reached in this activity, I summarized the following main points…
Discussion topic: online behavior in collaborative learning community

e. Product–based discourse. This type of discourse indicates that learners discuss how to work on the group product collaboratively and comment on or evaluate the group work to improve their shared product.

Just to say I have added some more comments to document for discussion. We need to wrap this group report up soon as we are meant to have finished it by now.

All these five types of discourse occurred in six group discussion and it is through these discourses that the participants shared the information, explore the problem, negotiate the meaning and integrate the main points and finally they collaboratively produced a group work by engaging in product-based discourse. We will select a sample session of one group to examine the details of group discourse process to see how they make meaning with the types of discourse as analytical framework.

5.2 Detailed Analysis of Group Discourse

The context of the group learning in this course is that first they introduced each other and then shared their experience working in E-learning in group discussion forum of Moodle, which was required in induction part and unit one. Then they moved to unit two and discussed to decide on a common topic. Once they decided on their topic, they tried to explore the relevant problems. And then they worked together to produce a group product. When they discussed how to work on the group product, one member proposed to use Google Docs to collaboratively writing the product. The group members accepted the proposal and then engaged in collaborative writing. After two week's group work, they worked out their shared product, a document with 2630 words in English. We select a session of group four discussions and their work recorded in Google Docs to analyze their discourse and interaction. To do discourse analysis, first we need to ask the right questions related to our research and then we will try to answer the questions by seeking the discourse evidence. We are concerned with the following questions:

How did they explore the topic and negotiate the meaning together?

What was the process of group interaction in collaborative writing? How did technology mediate this process?

How did the group members collaborative make their product ?

We will approach these questions by looking at the context and sequential structure of the discourse interaction, analyzing the function and meaning of the discourse, and exploring how knowledge is co-constructed and how technology mediate this process.

a. Explore the Topic together

First we choose the session of discourse in group four of five members. They were trying to reach a consensus of group topic and began to explore the relevant problem of this topic. Participants are represented by P. **(P1Charming P2 Bernie P3 Paul P4 Karen P5 Andy)**

P1 to All: *Hello, everyone, can we all agree that we discuss online behavior in collaborative learning community and how to facilitate collaborative learning? If we agree with that, can we brainstorm the topic and pose some specific questions? I think we can consider the following questions:*
What are online behaviors? How do we research on online behavior? …
I am looking forward to your comment and questions
P2 to P1: *I think now the topic is more practical and specific, and I am interested in it.*

P3 to All: *Just to say I'd be happy to go with 'Online behavior in collaborative e-learning' as our topic…I guess we need to have some fairly in-depth discussion around the topic*
P2 to P3 *Hi P3, Yes, it might be an idea to set up different topics - but I'm a bit worried about having too many sub-themes….*
P3to P2*Hi Bernie, Yes, there's a lot of merit in keeping it simple but as a minimum perhaps we should start for the 'post-decision discussion'.*
P1 to All: *Hello, as Bernie and Paul suggest, we need to have a deep discussion about our topic. I wonder if we can continue to think about the topic to come up with deep questions, and then we work together to address these questions. I have raised some questions. What do you think?*
P5 to P1*: OK. I am concerned with the two main points: process and content…Do we need some dimensions, such as frequency, length…?*
P4 to P1: *Really good questions P1, has anybody found resources that* ***address*** *this question?*

In this session of discourse, first P1 initiated the dialogue by asking if all the group members agreed with the topic, and then propose some question for further investigation. P1's discourse set the context for further discussion of the shared task. His questions met all the group members' responses, such as P2 is interested in it, P3 is happy to go with it, P4 thinks these are really good questions indicating he is also willing to discuss this topic. These are negotiative discourse and from their responses, we can see they have reached agreement about the group topic through in-depth discussion. And some group members such as P2 and P3 made some proposal of how to continue the topic. So the interactional structure is mainly proposal-response-proposal. This interaction mode contributed to the agreement. And at the same time they are exploring the relevant questions related to the topic. In this process, we can see P1 played a key role in exploring the question as he first raised some question for further exploration, and then again drew the group attention to the questions to make sure they keep to the topic. The sentences "I am looking forward…" and "what do you think" expected or invited the group members' responses. Such discourse promoted the group interaction and sustained the group discussion. P5 first made the response by raising the more specific questions, and P4 commented the questions and asked if there was relevant resource to this question. We can see all the group members participated in this discussion, and they reached the agreement about the group topic by employing negotiative discourse and explored the topic from different perspectives by using exploratory discourse. And these two types of discourse are interweaved together and contributed to the successful collaboration. The group interaction discourse involves asking, clarifying, and proposing discourse acts to explore the question and negotiate the meaning.

b. Engaged in Collaborative Writing to Make the Group Product

When the group were discussing the topic, one member propose to use Google Docs as editing tool to make their product. They discussed the advantage of the tool and then all the group member agree to use it. Here Google docs acted as a mediated tool to support and facilitate the group writing. And then they moved to the next stage: collaboratively write the document in Google Docs. And Google Docs become their common space for the group work, and at the same time they also had interaction in discussion forum in Moodle system. So how did the group collaboratively write the document? How did this tool mediate the collaborative activity? How did they coordinate their work between Moodle and Google Docs? We will explore these questions by analyzing the data in Google docs and Moodle.

First look at the group work space in Google Docs in figure 1.

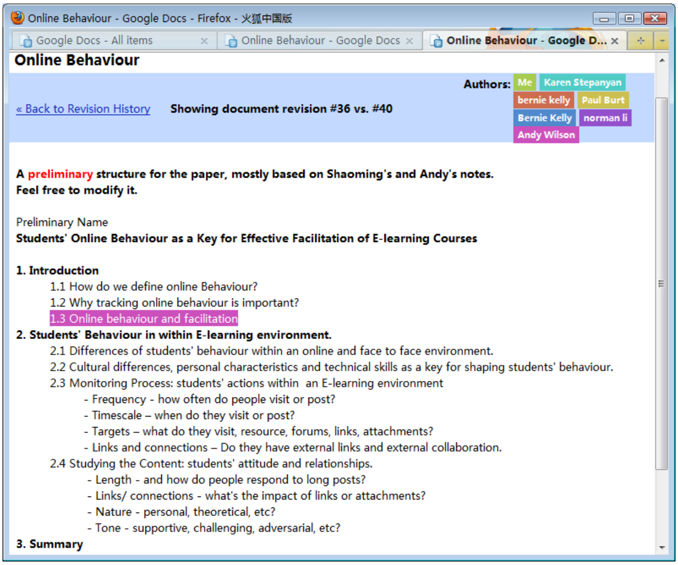

Fig. 1. Workspace in Google Docs

Google Docs is an online collaborative writing tool and its producers claim that it encourages the wring as a process approach. It provides a common space for the collaborators to write, edit and revise the article and finally product their shared product. One of its unique features is that it facilitates collaborative writing by allowing users to invite other "collaborators" to view and edit the document simultaneously. When a collaborator makes a change to the shared document, the change automatically takes effect and becomes visible to both parties. This synchronous characteristic of Google Docs prevents different collaborators from making conflicting changes. In the group discourse we can see P3 created Google Docs document with a preliminary structure mainly based on P5's and P1's posts and had invited other members as collaborators. Each author is designated in different colors so in the document you can easily see who edit which part and what has been done to the document. The reversion history function can help authors keep track of the changes in the document and see the different versions available. This makes the collaborative writing process public and visible. And the group collaborative writing is a recursive process, as the collaborators generate, develop and negotiate ideas and meanings in the writing process. In this process, revision is a key component of collaborative writing process because it serves as a means to explore, develop, and nuance the writer's intent and meaning [10]. By analyzing the history revision (see figure 2) we will see how the group members engaged in collaborative writing and working out the group product.

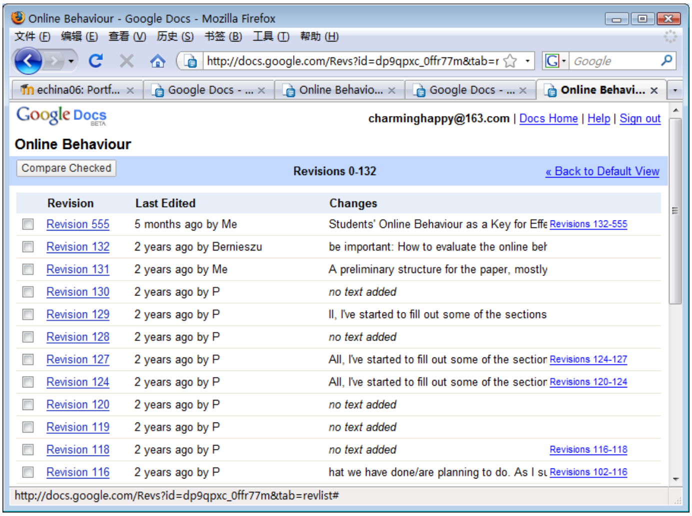

Fig. 2. Revision history in Google Docs

We reviewed and compared the revision history and counted the times of each member's revision in the group writing. The results are as follows:

Table 1. Revision times and types of interaction in group writing

Collaborator	Times of revision	Types of Interaction (times of revision)
P1	58	Interaction with document (Write, edit, view, revises) (12) Interaction with members: comment (46)
P2	242	Interaction with document (Write, edit, view, revises) (237) Interaction with members: comment (5)
P3	134	Interaction with document (Write, edit, view, revises) (18) Interaction with members: comment (116)
P4	106	Interaction with document (Write, edit, view, revises) (94) Interaction with members: comment (12)
P5	10	Interaction with document (Write, edit, view, revises) (10)

From the table, we can see all the members participated in collaborative writing. In this process, there were two types of interaction. One is the interaction between author and documents. And the authors added the text to the documents, and edited, viewed the documents. Another is the interaction between authors by making comments on the others' writing. As P4 proposed the working rule in Google Docs, the authors followed the rule and inserted a comment below after the text when they had different ideas. So the group members interacted with each other by commenting on each others' writing, this shows the sign of collaborative work.

How the collaborators interacted with each other can be observed in their discourse. As collaborative writing is also a social interaction process, it needs group's dialogue about how to develop new ideas, explore the new questions or improve the writing. The group members coordinated their group work in two ways. One way is to make comment in the text and discuss the relevant issues and another way is to continue their social discussion in discussion forum in Moodle system. Next we will see how the group members used these two ways to coordinate their group work and negotiate the meaning through the discourse.

We select comments on one question in collaborative writing in Google docs environment. The context is that when they came to the section 2.3 of the document, they were exploring how to monitor students' interaction process within an E-learning environment. One member proposed that their actions can be monitored from frequency, time scale, targets and links and connections. P2 added a comment below this point and then other members made the responses:

P2: *…Links and connections – Do they have external links and external collaboration? Can this be monitored? How? -Bernieszu 11/27/06, 5:21pm*
P4: Yes, it can be monitored depending on the system/VLE used. For example how many external RSS feeds has the student in his/her profile? However, I think that it will no be appropriate to discuss it in this section. We can either discuss it in 2.4 or remove it. Do you agree with that? -Karen 12/9/06, 4:09pm
P3: Hi Karen, I'm not sure I agree with your comments … Increasingly students are using tools like Skype and MSN to discuss the learning activity they are undertaking and this communication is invisible to the tutor. …. -Paul 12/11/06, 9:16am
P1 to P3: yes, I agree with you, Paul. it is really difficulty to track or monitor the students ' activities external. and My students would like to use QQ a very popular online chat tool in china. I ask them to upload their text-based transcripts to their discussion to share with

In these conversations, we can see first P2 asked some questions about how to monitor links and connection in online interaction, and then P4 made the response and expressed his opinion. But P3 offered the different idea with the reasons and P4 took up P3's ideas and expressed his agreement with his opinion. The group explored this question and negotiated the meaning of this point by inserting comments in the text. These comment discourses are negotiative and exploratory. Here is the final version about this question in the document:

--Links and connections can be monitored depending on the system/VLE used, but increasingly students are using tools like Skype and MSN , or QQ in China, to discuss the learning activity they are undertaking and this communication is invisible to the tutor

The text shows that the group members had reached the shared understanding and taken the different perspective into consideration. And the ideas were contributed by the group members and we can not tell their individual ideas in the final product as it created collaboratively and shared by the group. The comment tool in Google Docs facilitated the group work and promotes their communication and fostered their collaborative writing.

From the above discourse analysis, we can see the group members were mainly involved in cognitive interaction, sharing the ideas, negotiating the meaning and creating the new knowledge. But collaborative writing in Google Docs is a social practice, and the group members need the social discourse to coordinate their work. So when the group members worked together on the shared document, they continued their social interaction in the discussion forum in Moodle system. It is important to coordinate their discussion with these two workspaces. As Stahl [11] pointed out that a major issue for groups working in environments with multiple workspaces is how to coordinate communications in the space and how to shift group attention from one space to the other. We will see how the group members coordinate their collaborative work in Moodle system. Look at the following the discourse in the group discussion forum:

*P1: …Now we are **collaboratively writing** our group report, and I think we are making progress, but we need to contribute more to the document as we have not enough time left. **Do you have any ideas?*** **(Evaluate and request)**
*P3: Hi Karen, **Well don**e for setting this up.* **(Evaluate)**
*P4: Hi folks, just a short notice to **inform you** that I have **edited** sections 1.1…* **(Inform)**
*P4 : Hi P3, Using comments seems to be a **good idea**. And **it works** for asking questions or making proposals, isn't it? Yes, I agree…* **(Evaluate)**
*P4: Hi P3, **Great!!!** You have done a **really impressive amount of work**! Thank you.* **(Evaluate)**
*P3to all: **Just to say** I've **added** a little more to Google Doc paper but am conscious of currently dominating the writing. Please all feel free to **add** your contributions to the paper. (***Inform and make a proposal***)*
P3 to P4: *Hi Karen, Thanks and thank you for **adding** to the document. Now all we need is for some other contributions so it can be finished.* **(Express emotion and request)**
*P2 to all: I've **added** some comments …* **(Inform)**
*P1 to all: hello, I have **added** some ideas …Would you please give **more ideas or some comments**?* **(Inform and request)**

*P2: Hello everyone, I've **don**e another bit of tidying up/editing.… The only section that then needs more work is the summary. Any volunteers for getting that into shape?* **(Inform and request)**
*P1: hello, P2, I really **appreciate** your work and suggestions. And I will **edit** the summary and the section…* **(Express emotion and accept the offer)**
*P2: I've **added** a very short summary and I don't know if everyone will agree with it…* **(Inform and make negotiation)**
*P1: Hello, P2, **well done** for the group product. I read it and think it is really good.* **(Evaluate)**

We analyze these discourse moves and categorized them as inform, evaluate, request and make negotiation (see the fond words in brackets). These discourse moves indicate that the group members inform each other what s/he had done in Google Docs, request group members' contribution and evaluate their work, mainly praising their efforts. The function of these discourses is to coordinate their collaborative work, encourage collaboration, build the interpersonal relationship and enhance the group cohesion. These discourses are mainly social discourse, which again shows that collaborative learning is a social practice with both cognitive interaction and social interaction. The result of their collaborative work in Google Docs and discussion forum in Moodle is that they successfully worked out the shared product.

6 Conclusion

This study focus on the nature of meaning making in CSCL as it is the central to collaborative learning. By employing sociocultural discourse analysis, the authors analyzed the discourse of one case course in Moodle environment. The study shows that when group members participate in group learning, they are engaged in different types of discourse and through these discourses, they share information, interpret ideas, explore the problem and negotiate meaning and finally reach the shared understanding. When they worked in multiple workspaces, they tried to coordinate their work, build interpersonal relationship to enhance group cohesion for successful collaboration. Discourse analysis of group discourses shows how they collaboratively created common ground, built up each other's ideas and produced the shared knowledge artifact. The group product is the result of their collaborative efforts. The study proved that this method is effective in exploring the process of meaning making in CSCL environment.

Acknowledgement. This Paper is based on work funded by Humanities and Social Science general research project of Chinese Ministry of Education: *Research on discourse for promoting collaborative knowledge building in online learning* community (NO：13YJA880004).

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Research on Application of Collaborative Knowledge Building in Blended Language Classroom Teaching

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Abstract. In language teaching, collaborative knowledge building (CKB) can be used to strengthen students' participation, communication, cooperation and viewpoint-sharing and as a result, improve students' academic achievements and their leaning abilities as well. This paper analyzes how to use CKB to organize language classroom teaching and studies the effects of CKB-based teaching in a blended language classroom. The results indicate that the application of CKB in blended language classroom teaching is feasible, operable and effective. CKB-based teaching can improve students' ability to use language and their comprehensive quality, especially when enough time, relevant training and various supports and encouragements provided. But the more successful application of CKB-based teaching will be based on further research concerning teachers' intervention, teaching resources, gender differences, and evaluation methods etc.

Keywords: Knowledge building, Collaborative learning, Blended learning, Language classroom teaching.

1 Introduction

In the 21st century, the educational field has confronted the unprecedented opportunities and challenges because of the world multi-polarization and economic globalization, the rapid progress of science and technology and the increasingly fierce competition. In order to meet the needs of the society, various reform measures have been taken in foreign language education in China, such as to discuss foreign language teaching from the perspective of ecological linguistics [1], to reform the foreign language teaching based on cooperative learning [2], and to promote the foreign language teaching by using CALL [3] to name just a few.

But in Chinese language classroom, as the result of deep influence and restrictions of traditional education thoughts and ideas, the teacher-centered instruction ,the exam-oriented education and the grammar-translation method are still flooding[4]; the teaching model is still outmoded and single [5], and "teaching" is stressed heavily while "learning" is ignored [6]. Consequently, what students learned is incomplete,

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 45–56, 2013.

inert and rigid [7], and cannot be used in daily life effectively and flexibly. Therefore, to reform the traditional educational thoughts and ideas is significant to change the current status of Chinese foreign language teaching.

In fact, many new thoughts and ideas, such as constructivism teaching, situated learning, corpus linguistics and so on, have already played important roles in promoting the reform in foreign language teaching. Among them, the Knowledge Building (KB) has been attached great importance to.

According to Scardamalia and Bereiters, KB is "the production and continual improvement of ideas of value to a community, through means that increase the likelihood that what the community accomplishes will be greater than the sum of individual contributions and part of broader cultural efforts" [8]. In the process of KB, new knowledge cannot be simply assimilated or accommodated under the help of a more knowledgeable person but through mutual collaboration, in which participants engage in problem solving or inquiry activities to improve individual understanding and public community knowledge in a specific domain[9].

Collaborative Knowledge Building (CKB) focuses more on collaboration and shared understanding among group members. In this process, individuals contribute to the group and gain help from other group members .In CKB, the important ways for learners to build knowledge is through discussion, reflection and shared understanding. So in CKB-based language learning, the language study, which is more compatible with cognitive principles of language acquisition, will be more efficient.

Actually, some research work related to CKB and language teaching and learning has already been carried out. For instance, Chen has analyzed how to use network-based resources in English teaching from the perspective of CKB [10]. Cheung studied how the undergraduate paraphrased sentences by using CKB and classified the forms of paraphrasing [11]. The literature study has showed that not many efforts have been given to the application of CKB in language teaching and learning esp. in classroom teaching, even though CKB could be successfully employed in this field.

In order to further promote the application of CKB in language teaching, this study concentrates on how to use CKB to organize language classroom teaching and studies the effects of CKB-based teaching on students and teachers in a blended language classroom.

2 Methodology

2.1 Participants and the Course

Altogether 59 undergraduates at School of Foreign Languages, Guangdong Polytechnic Normal University, participate in this study. Among them, there are 2 boys and 57 girls. Class A (1 boy, 29 girls) take part in the whole journey, while class B (1 boy, 26 girls) begin to be involved in the study one term later.

The course entitled *Contemporary English* has been selected for the application of CKB-based teaching. It is a required course to develop the comprehensive language abilities of English majors, and generally, the traditional teaching method has been employed in this course. Moreover, according to the arrangement of the curriculum, this course lasts four semesters with average 5-6 periods in a week. Therefore, the comparative study between the traditional language teaching and CKB-based teaching can be fully conducted, and the study time can be also guaranteed.

2.2 Research Design

In order to realize CKB in foreign language classroom systematically, we propose a CKB model for language classroom teaching based on the previous researches and features of language learning, esp. on the reference of Stahl's KB model in 2004 (see Fig.1.) [12].

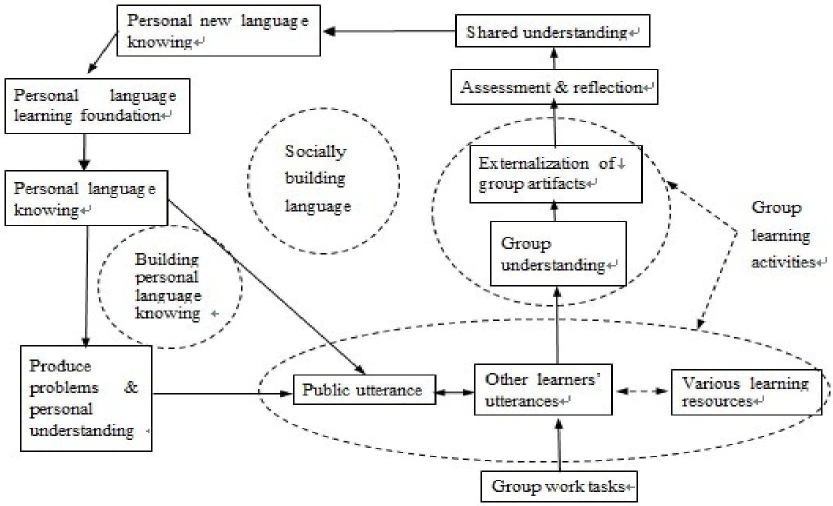

Fig. 1. CKB Language Classroom Teaching Model

This model, which is a cycle without beginning and ending, proposes a general method to organize CKB in a foreign language classroom, mainly covering the language learning foundation of language learners, organization of group study, design of CKB activities, externalization of group artifacts, assessment and reflection etc.

What's more, a blended learning environment with the combination of face-to-face learning and online learning has been provided. Online learning, basically realized through modern information means, such as E-mail, SMS, QQ group discussion, has served as an important supplementary and extending part of classroom learning. Through online learning, students can interact with each other without time limit and space limit, which can greatly facilitate their knowledge construction.

2.3 Research Methods

In order to analyze the feasibility and effects of the CKB model, action research has been used in the study. Action research is a spiral process, and each developmental cycle includes four phases, namely plan, action, observation and reflection (Kemmis & McTaggart, 1988). What's more, the questionnaire, interview, teaching journal, reflection report and test are the specific operation methods employed to study different contends in the process of the implementation of the CKB model. As to the data collected in the study, SPSS is used to analyze the quantitative data, while Nvivo is used to deal with the qualitative data.

3 Findings

Compared to the traditional teaching method, CKB-based teaching is a quite new phenomenon in foreign language teaching. After a 2-year study, CKB-based teaching is starting to have positive effects, and the main findings are as follows:

3.1 Learners' Understanding and Attitudes Towards CKB-Based Teaching

The ultimate goal of teaching is to promote students' progress and development. As a new teaching approach, whether it can be recognized and accepted is the prerequisite for the smooth implementation of CKB-based teaching. The results of data analysis of questionnaire and interview manifest that it is the first time for 93.3% students to be involved in CKB-based teaching, but after experiencing, 80% students show that they can accept CKB-based teaching and engage in it actively, and 16.7% students find it difficult for them to follow for they are unfamiliar with it. In addition, 70% students like CKB-based teaching and 23.3% dislike. 80% students have already formed positive attitudes towards CKB-based teaching and shown their willingness to continue to use it.

Meanwhile, research shows that students have been obviously affected by CKB-based teaching in one way or another, especially students' understanding of the nature of language teaching and learning.

Learners' Understanding of the Nature of Learning. In CKB-based teaching, knowledge is not static and learners have to construct them initiatively. Actually, CKB-based teaching impels learners to reflect, to compare, and gradually realize learning is a self-disciplined and self-managed process. The data reveal that learners understanding of the nature of learning; learners' roles, learning effectiveness have been greatly affected by CKB-based teaching (See Table1).

Table 1. Learners' Understanding of the Nature of Learning

	Learners' Understandings	Examples for Analysis
Nature of Learning	the process of knowledge construction by learners	"In the past I was forced to learn but now I want to know more and to learn more. I have more chances to communicate , to discuss and to think, and I learn through problem solving."
Learners' Roles	participants, contributors, constructors, actors	"I think I have become lazier because of being passive learners, but now I have to be engaged in study, to analyze, to solve my own problems and my classmates' problems as well, and I begin to realize I have to undertake my own learning and I am the owner of my study."
Learning Effectiveness	to gain knowledge and skills, and cultivate various competence	"I feel curious and I am interested in it, and I want to express, to discuss, to share, I think my abilities to manage, to cooperate improved a lot."

Learners' Understanding of the Nature of Teaching. For the differences between CKB-based teaching and the teacher- centered teaching, 96.67% learners admitted that they began to think about what language teaching should be. CKB-based teaching has affected learners understandings about language teaching, esp. in the aspects of teachers' roles, teaching objectives, teaching activities, teaching environment etc. (see Table 2).

Table 2. Learners' Understanding of the Nature of Teaching

	Learners' Understandings	Examples for Analysis
Nature of Teaching	learner-centered teaching	"In the past, we were just passive learners; but now we have more chances to talk with each other and study at our own pace, and we are starting to become the owner of our study."
Teachers' Roles	facilitators, guiders, providers, lecturers	" In many cases, students take up much time In class to discuss or share, while the teachers help us to solve problems and difficulties we cannot solve." "Teachers provide us with many learning materials and recourses through QQ group and e-mail."

Table 2. (*Continued)*

	Learners' Understandings	Examples for Analysis
Teaching Objectives	to cultivate students into an independent and self-disciplined persons	"We have to prepare well before we have classes , if we are lazy, we learn nothing in class. We are forced to think, to communicate."
Teaching Activities	activities designed to help students engage in learning	"In the past, what we have to do in class is to listen and take notes, but now we have to solve the problems by ourselves first and we communicate, negotiate, share a lot in class and we have become more open-minded and flexible."
Teaching Environments	to create supportive and constructive learning environments for learners	"In the past, most of our study took place in the classroom, but now it seems that we learn everywhere. We can read materials and information shared by the teacher and our classmates in QQ group, and we can discuss in QQ group, and get help from others quickly, which is very convenient."

3.2 Learners' Understanding and Attitudes Towards Group study

CKB, as a collaborative and purposeful activity [13], emphasizes learners construct knowledge collaboratively [14], so group study becomes the basic form of CKB-based teaching. In group, learners work collaboratively to create, optimize and improve knowledge as community members. Learners' understanding and attitudes towards group study have direct effects on CKB-based teaching.

In fact, most students had group study experience. But it is discouraging that just because of their past experience, many students don't like group study, and think group study is inefficient. But after one-year's group study experience in CKB-based teaching, 48.3% students hold positive attitudes towards group study, 3.4% negative, and 48.3% students have been changing their attitudes from the negative at first to the positive at present, as is evident in the following students' comments.

Student A: I had group study experience, when I was a secondary school student. But, till now, I think I have benefited much from it, for the interaction between the teacher and students are really working well.

Students B: I didn't like group learning at all when it was introduced in our class last year. I didn't think it could be helpful, and actually I regarded it as a waste of time. Now I have recognized that I studied in a passive way and depended too much on the teacher. I am seldom involved in learning completely. Now, I have learned how to engage in group study, especially in the process of group knowledge building. My group mates are all very active and the learning environment is very comfortable. I must say that now we have truly participated in learning.

In the following, four aspects have been generalized to demonstrate students' understanding and attitudes towards group study based on the analysis of reflective journals of 29 students.

Group Study Interest. Group study interest refers to the learners' lasting psychological tendency to group study. CKB group study, which can arouse learners' interests and zeal for study for its novelty and attraction, leads to learners' willingness to participate in it actively. Student C once mentioned that: "Group study is a fresh and interesting thing for us who are used to traditional rigid teaching mode. Our learning interest and passion can be easily aroused. Because of group study, classroom was not controlled only by the teacher, we the students act as cooperators now. Above all, we have more chances to speak English. That is the power of our study."

Group Participation. Group participation is essential for successful group study, and it means the manners of the learners' psychological activities and the efforts of the learners' behaviors, covering behavioral, cognitive and emotional participation. Students have realized that participation is the key to successful group study, and it is also on behalf of a sense of responsibility. In addition, good preparation before class is an important guarantee for real and complete participation in group study.

Group Study Skills. Study indicates that it is quite necessary for learners to know how to use different group study skills flexibly in group study. Learners have already realized that the very skills, such as how to provide effective leadership, decision-making, trust-building, communication, and conflict-management, and be motivated to use the prerequisite skills and so on are necessary to promote effective group study [15]. The following comments are some typical examples.

Student E: I am always the first one to speak in my group, and often use 'Any question?' to arouse my group members to speak. I think the biggest challenge in group study is to express myself clearly in English. And I find that to read more, to remember more and to express myself slowly can help me a lot.

Student F: I think everyone should know his commitment clearly in group study, and then the group study will become more disciplined and effective. I will listen to others attentively and patiently, for this will help me to understand what other students think, what the difference is between their understandings and mine, and what I can learn from others.

Group Cooperative Learning. Different from individual study, group cooperative learning refers to the group members who share common interest work together to solve problems and realize achievements through communication, negotiation and sharing. Students conclude that they benefit greatly from group study for they can share and exchange opinions, get hints, encouragement, feedback, resources freely and immediately, as is shown in the reflection of Student H.

Student H: Group learning offers me a platform for knowing other's thinking. I really knew the power of collaboration from our group learning. One person's energy is so imitated. Sometime a simple problem may puzzle me for a long time. However, my group mate could give me a little reminding for helping me get out the difficult situation, and it is really impressive to me.

3.3 Design of CKB Language Teaching Activities

CKB-based teaching focuses on the knowledge construction of students in the process of participation, communication and cooperation in the process of knowledge construction. So the activities involved in CKB-based teaching are different from those in lecture-based teaching. The basic principle to design CKB-based teaching activities is to provide students opportunities to build both public and individual knowledge through flexible participation, communication and cooperation. In the study, a basic process of CKB-based language teaching activities has been formed to help teachers to design and organize various CKB-based activities according to students' real needs and teaching goals, such as theme-based discussion, problem solving activities, role play and so on (see Fig. 2.). Next, a chosen case will be used to illustrate the specific operations of the basic process and its effects as well.

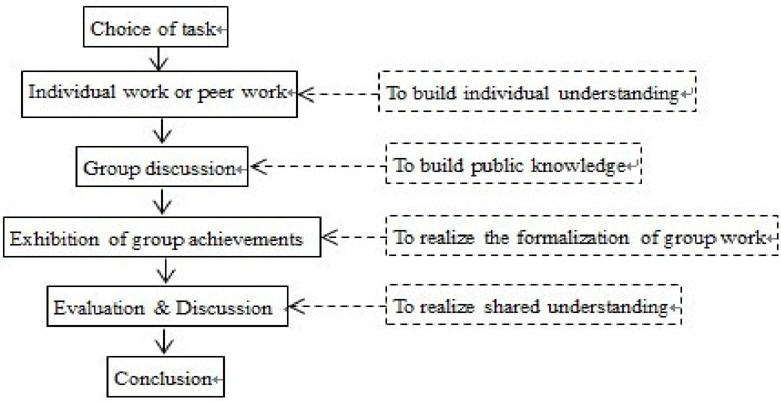

Fig. 2. Basic Process of CKB-based Teaching Activities

A Case: Problem-Based Text Understanding. In *Contemporary English* teaching, to understand, analyze and appreciate the selected texts is quite important. Different from the transfer instruction, in CKB-based teaching, students complete the teaching goals by means of problem solving or task-based activities. Teachers mainly act as guiders and facilitators. The operation steps are as follows:

Individual study: Based on self-study, an individual problem list is formed before class according to the student's understanding of the text.

Group discussion: In class, students work in a 4-person group to solve the problems posted by group members through discussion and negotiation. After that, a group problem list can be produced for the unsolved problems in group discussion.

Achievements sharing: Each group pastes their group problem list in the public discussion area in class and invites the whole class to solve the remaining problems together.

Evaluation & Reflection: The teacher evaluates both individual study and group study, and deals with the difficulties and the problems ignored by the students.

Problem-Based Text Understanding, which combines individual study and group study, pays attention to differences among students, helps students to build trust, mutual relationship, and arouses the students' learning enthusiasm and initiative, can promote CKB effectively in language class. Fig. 3 and Fig. 4 are two specific examples representing "group discussion" and "achievements sharing" perceptively in *Problem-Based Text Understanding*. The selected text is Mandela's Garden in *modern university English*. Fig. 3 is the group study problems list emerging from group discussion, and Fig. 4 is results of group study problems list after the whole class discussion and negotiation.

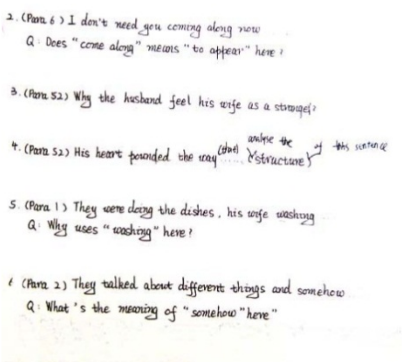
2. (Para 6) I don't need you coming along now
Q: Does "come along" means "to appear" here?
3. (Para 52) Why the husband feel his wife as a stranger?
4. (Para 52) His heart pounded the way (that) ...... analyse the structure of this sentence
5. (Para 1) They were doing the dishes, his wife washing
Q: Why uses "washing" here?
6 (Para 2) They talked about different things and somehow
Q: What's the meaning of "somehow" here"

Fig. 3.

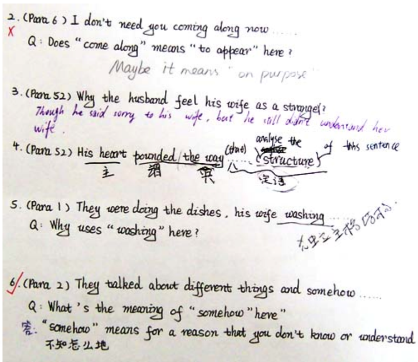
2. (Para 6) I don't need you coming along now ......
Q: Does "come along" means "to appear" here?
Maybe it means "on purpose"
3. (Para 52) Why the husband feel his wife as a stranger?
Though he said sorry to his wife, but he still didn't understand her wife.
4. (Para 52) His heart pounded the way (that) ...... analyse the structure of this sentence
主 谓 宾 定语
5. (Para 1) They were doing the dishes, his wife washing ......
Q: Why uses "washing" here?
6. (Para 2) They talked about different things and somehow ......
Q: What's the meaning of "somehow" here"
答: "somehow" means for a reason that you don't know or understand
不知怎么地

Fig. 4.

4 Discussion of Findings

4.1 CKB-Based Language Classroom Teaching Is Feasible and Operable

Research shows that, through participating and experiencing, CKB-based teaching has gained most participants' recognition and acceptance. Learners' positive and affirmative attitudes towards CKB-based teaching and group work suggest that the application of CKB in language teaching is feasible. Moreover, most learners have expressed their confidence in and expectations to the bright future of CKB-based teaching and hope that they can continue to use it. Additionally, the basic process of CKB-based teaching activities provides specific steps to design CKB activities and ensure the effective implementation of CKB-based teaching.

4.2 CKB Teaching can Improve Students' Ability to Use Language and Their Comprehensive Quality

The research states that CKB-based teaching is effective, which can not only changes students' understandings of the nature of language teaching and learning, but also helps students to develop new learning behaviors. Based on the research on students' understanding and attitudes towards group study, that many students' attitudes have gradually changed from the negative to the positive partially shows that CKB-based teaching can meet the learning needs of the students effectively, and win their recognition.

CKB teaching, emphasizing students' participation, communication, cooperation and sharing, has impelled students to explore, reflect and express. Students "learn language through doing", which exactly reflects the original way of language learning.

Owing to CKB teaching, gradually students are equipped with the consciousness, courage and confidence to speak English, and more and more students can look for, even create opportunities to training themselves, such as practicing oral English together with classmates, and organizing English corner regularly, join in drama performance. Students have better self-management consciousness, and more time and efforts have been devoted to language study, and students' academic achievements and the ability to use language have been improved. In 2010, the first pass-rate of Test for English Majors Band 4 of students participating CKB teaching was 86.44%, 30% higher than that of the whole country, partially owns to the CKB teaching.

4.3 Blended Learning Environment has Provided Powerful Guarantee of the Smooth Implementation of CKB-Based Teaching

Since CKB-based teaching stresses students' participation and communication, through online learning, students can interact with each other anytime and anywhere, which greatly expands the interaction among students and provides enough opportunities for students to conduct CKB. Moreover, the needs of individual student can also be satisfied owing to the timely help and feedback from companions or teachers esp. when they work on the assigned tasks. Therefore, CKB-based teaching is more effective in a blended learning environment.

5 Conclusions

To apply CKB in foreign language teaching provides a new perspective in the reform in language teaching, for CKB-based teaching can activate classroom atmosphere, arouses students' enthusiasm and motivation for learning, improve students' ability to use language, develop students' thinking. Though CKB-based teaching is promising, the application of this new mode of language teaching needs enough time, relevant training, patience and perseverance, and various supports and encouragements. For example, CKB-based teaching makes teachers confronted with great pressure and challenges, and teachers need to continuously develop new teaching strategies create environments and design activities to support and courage students to construct knowledge. So the more successful application of CKB-based teaching will be based on further research concerning teachers' intervention, teaching resources, gender differences, and evaluation methods etc.

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Study on Training Model and Platform for Clinical Medical Skills

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Abstract. For exploring an effectively way for training medical talents and meeting the demand of "the minimum basic requirements of global medical education", this paper discusses the design of training model and platform for implementing on-line training of the clinical knowledge and skills. An experimental result is given.

Keywords: Clinical medical skills, training model, platform, ICT.

1 Introduction

The clinical skills are the most important capacity for all doctors, so how to strengthen the training of basic clinical skills is the key issue in the medical education. In the traditional teaching, basic clinical skills are learned by clinical apprentice ways. Such way has certain advantages, but has obvious deficiency. For instance, in order to master some basic clinical skills, students or trainees need to do many items and dozen times, even many practice repeatedly throughout the operations, and should be always guided and corrected by the masters or teachers. If the student only listen the teacher's speech or see teacher's operating, it is impossible for improving the clinical skills. Sometimes the clinical object is a patients, trainee is not allowed to take repeated operating. Also as clinical apprentice ways are normally guided one to one, it is hard for more students to see the clinical operation process. Especially in recent years, clinical skill teaching is more and more difficulty, as student numbers increase, limited typical cases of hospital patients, people more and more high requirements for the clinical skills, less and less the typical patient willing to let students to practice. The lack of opportunity for student practice is more serious. Therefore, the original way relied mainly on the clinical apprentice for training students' clinical skills already cannot satisfy the need of medical teaching.

This study is to use advanced digital communication technologies for remedying the shortages of traditional methods, to explore a reasonable training model and develop a platform with a medical knowledge and clinical skills resources. Based on the training model and platform, the students can not only learn some clinical knowledge, promote comprehensive ability, and shorten their study time from clinical theory to concrete operation, but also speed up their role transformation from students to new doctors.

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2 Clinical Training Model

Any skill training or teaching activities will involve a "model" which is a simplified form for describing action process and sequence. A model can also be regarded as "theory value orientation and the system of corresponding practical operation mode, and it is the specific unity of the structure and function, and form and content". Generally, most models have three major characteristics: (1) abstract description for the original system; (2) the key factors related to research problems; (3) showing the relationship between the relevant factors. In fact, a model itself is a system which is combined with the core elements of research object, and these elements are related and affected. Therefore, in the actual design or use of a model in the process, as long as give full consideration to the connections between these factors and the mutual effect, the model can effectively play its specific functions. Of course, any model is not a constant and not a model all problems will be readily solve, it must be ongoing inspection, correction and improvement in the practice process.

2.1 Model Framework

As this study focuses on the clinical skills training based on technology environments, the model construction should not only consider technical support elements, more important is from the perspectives of medical clinical skills training which needs the support of particularity related theory. From technical supports, the model design will mainly consider: local area network environment, vivid reappear technologies (such as virtual reality technology), distance communication and collaborative consultation technologies, micro-teaching and P2P audio broadcast technologies, and sensing interaction and high resolution display technologies. These technical supports for the construction of the model provide an indispensable technology environment. From theoretical basis, there are many available theories for supporting model construction, such as problem-based learning and improving (PBLI), situated cognition and learning, practice community, cognitive apprenticeship, knowledge management, the micro-teaching theories and methods, as well as Miller's pyramid medical model. Based on the technology environments and theoretical basis, the model structure is shown in figure 1.

The model covers each important link or step for medical clinical skills training, and each link clearly tells learners the entire training process or step.

In the model, medical clinical knowledge and skills training is the core part and training target is directly corresponding with Miller's pyramid medical model. Object recognition, content choice, manner determining and reflective evaluation are the main components of the model. They indicate each link or step of the model application process, and they are related and assume their respective specific function. The different elements around the network environment (dotted line ring), such as learners, practice community, knowledge theory, micro-teaching, etc., are the specific objects, contents, and support conditions for model execution.

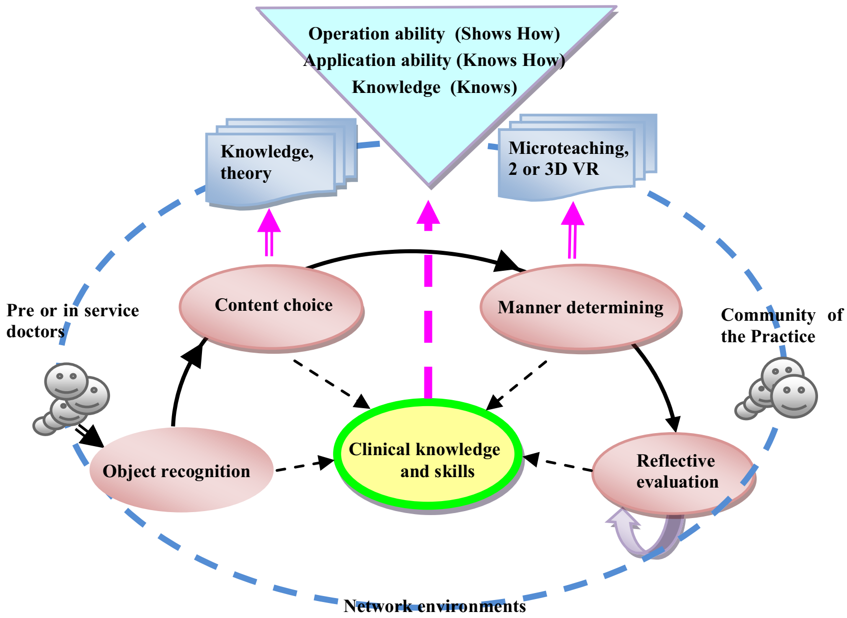

Fig. 1. Model structure

The model execution starts from the object recognition, which means to affirm who participate in training. Here, the object refers to all enrolled or registered users, including all medical professional pre-service and in-service doctors. The object recognition will also be an important premise for determining follow-up training content choice. After the object recognition, next step is the content choice. The content choice is generally made by learners who can choose the contents he/she wants to study. The main range of contents involves clinical knowledge and theory (Knows), clinical application ability (Knows How), and clinical skills (Shows How). Manner determining is the step after the content choice. This step refers to learners to choose the way or manner for learning. Due to the selected content is difference, the way to learn is undoubtedly not the same. For instance, chose the clinical knowledge and theory (Knows), the manner is usually reading, listening or seeing. Of course, if chosen the operation ability (Shows How), the manner will generally use the two or three dimensional virtual environments in which learners can dissect or operate virtual experiments. There is no doubt that the learning manner determines the learning effect, so the manner determining link is the core part in this model. Reflective evaluation link is entered into the actual learning process.

2.2 Supporting Conditions for Model Application

In order to realize the effective application of the model, some supporting conditions are necessary. For this model, one example of the necessary conditions for application supports is the network environment. This also means that each component (object recognition, content choice, manner determining, and reflective evaluation) running is based on the network environment. Of course, because there is no universality model for clinical training or learning, so different model application has different support conditions. This model relates to the support conditions as follows: network environment; training object; training content and operation, and practice community.

(1) Network environment
Because this research is directed at Xinjiang Construction Corps for distance medical clinical skills training requirements, the network environment refers to the corps existing network environment. At present, the Xinjiang construction Corps, involving 14 divisions, has realized the broadband Internet/local area (Internet/Intranet) architecture network interconnection, also using the distributed network system structure, which can better meet the medical institutions training needs. Based on the browser/server (B/S) three layer structures, streaming media control server (MCU) configuration, audio and video broadcast, based on WEB2.0 digital clinical microteaching system, 2 to 3D virtual reality lab access, and the strong support of the digital resource.

In the practical application process, any user (trainer or trainee) as long as through the browser can access the platform for sending or receiving learning or training resources. Also the network environment will also support the connection with outside (not the corps region), real-time live on an expert special reports, lectures, surgical teaching, distance consultation, etc. In addition, local audio/video live, demo teaching, 2 or 3D virtual simulation, learning or teaching process recording, multimedia courseware access functions can be supported.

(2) Training object
The training object is involved in many aspects, such as on-the-job doctors, medical learners, all kinds of medical personnel, medical school teacher, etc. From the medical theory or knowledge point of view, the staff will be the object of training. For clinical skills learning, training object mainly concentrated in the on-the-job doctors and medical students.

The training object, in fact, also is the member of the community of the practice. During the study, they should also actively involve in the community communication and interaction, this is not only beneficial to one's own learning, will also share with others the knowledge and experience.

(3) Training content
In this model application, rich and various forms of content support is crucial. Of course, as clinical skill is the practical professional skills and the skills training is directly related with two main subjects: Basic medicine and Clinical medicine. The contents involve a wide range, including not only physiology, biochemistry, pathology, pharmacology, and also related diagnostics, human anatomy, etc. In addition, the clinical skill training is also requires to make classification for human disease etiology and mechanisms. So how to carry on the reasonable scientific classification for clinical medicine content, between the various branches segmentation, content arrangement and organization, and content representation. These are also key points for supporting effective application of the model.

The classification in this study is based on clinical skills function and effects, also referring to the Miller gold tower medical model. The specific classification is shown in figure 2.

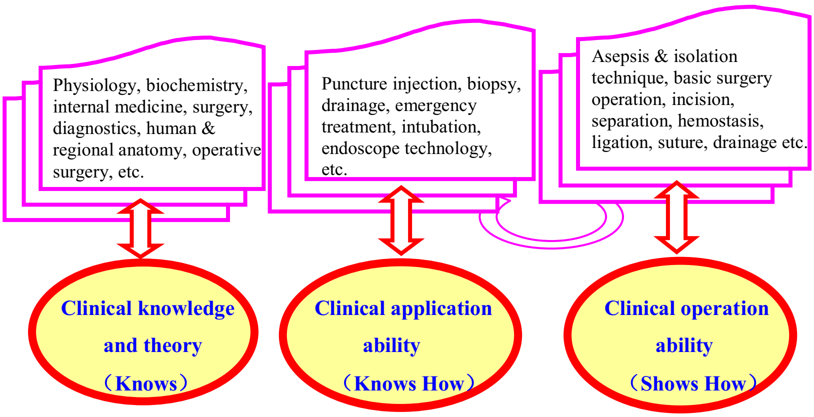

Fig. 2. Specific classification of training contents

(4) Training methodology

Training methodology means the specific way that can be applied in the process of clinical skills training. There are many specific ways for learner to select, such as video on demand of expert lectures, courseware demonstration, microteaching, and 2 or 3 D animation to display human organs or virtual operations. Generally speaking, the training content is different and the training manner will also be different. For example, knowledge and theory training usually use the way of teaching courseware demonstration or expert lecture videos. And application ability training will take the microteaching, case on demand video, 2 or 3 D animation. Through repeatedly viewing medical expert's clinical operational skills or process, the learners can build their own clinical application ability. In addition, for the operation ability, the training will be mainly based on 2 or 3 D medical virtual reality technologies. By creating a virtual experimental environment, the learners can practice dissect or surgical skills.

Because this model is for medical clinical knowledge and skills training, the methodology will also according to the actual training content need to set up. In order to cultivate practical knowledge and ability requirements, four kinds of training methodologies of this study will achieve: learning on demand, distance interactive demo, microteaching, and 2 or 3D virtual surgery experiment. These methodologies reflect the supports for model applications, and also highlight the uniqueness of clinical skills training. The major training methodologies are shown in figure 3.

3 Platform Design

Based on the training model, it is necessary to have a specific platform for supporting training. According to the practical needs, the platform should include two major parts: hardware environment and software application system. Hardware environment is to support software application system and users for using the network facilities and

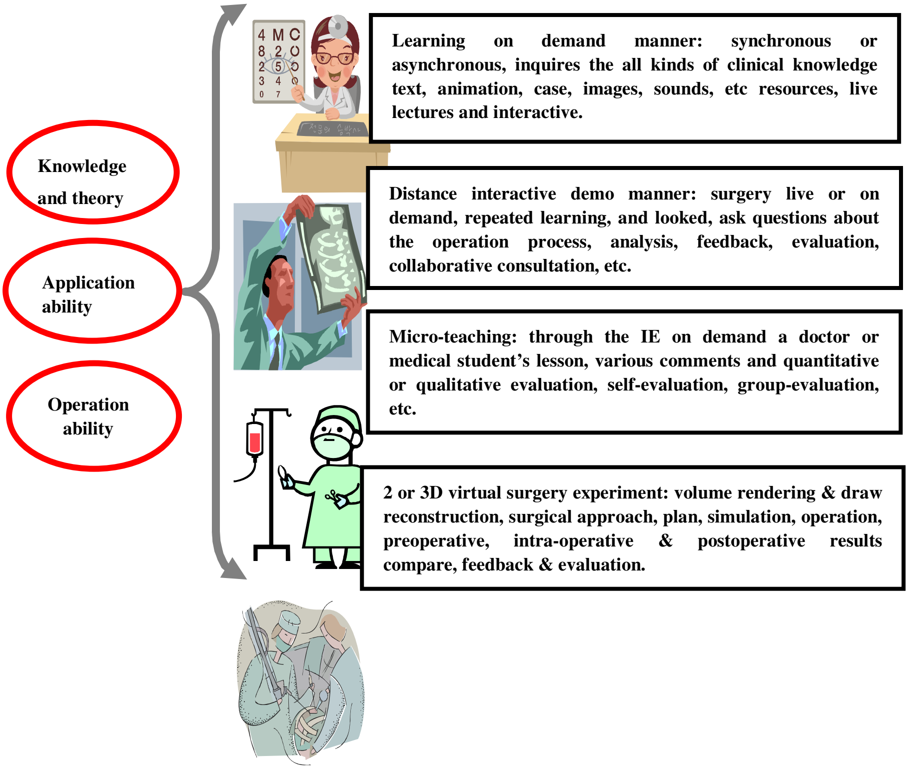

Fig. 3. Training methodologies

all kinds of hardware equipment, such as corps distance medical education network system and satellite transmission system. The software application system is a specific executive program and can support users to carry out the training or learning.

From a functional perspective, the platform includes three main components: the control and management, multimedia teaching and clinical skills training and learning. It can realize distance education, distance communication, user service support, clinical multimedia teaching, including real-time audio/video teaching, live or on-demand, microteaching demonstration, etc. It can also implement distance cooperative medical consultation, 2 or 3D virtual surgery experiments. In a sense, this system integrates most technology-supported clinical teaching, learning, and training. The platform structure is shown in figure 4.

3.1 Platform Components

The platform includes three major function modules, they are: Control and management, Multimedia teaching, and Clinical skill training. The detail function for each module is described as following.

(1) Control and management

Realizing platform management and control, the main features include: users management and control (user interface), information communication, various services support (including identity affirm, learning contents and ways choice), the multimedia teaching, learning and training process management, learning resources management, etc. It is the control and management center of whole platform.

(2) Multimedia teaching

This module offers a traditional way for teaching or learning and supports all teaching activities, including medicine clinical theory and knowledge learning, multimedia teaching in live or on demand, case teaching, expert microteaching lecture, and viewing or emulating, etc. It can provide many medical courses and resources linked many difference classrooms for more choice for learners at the same time.

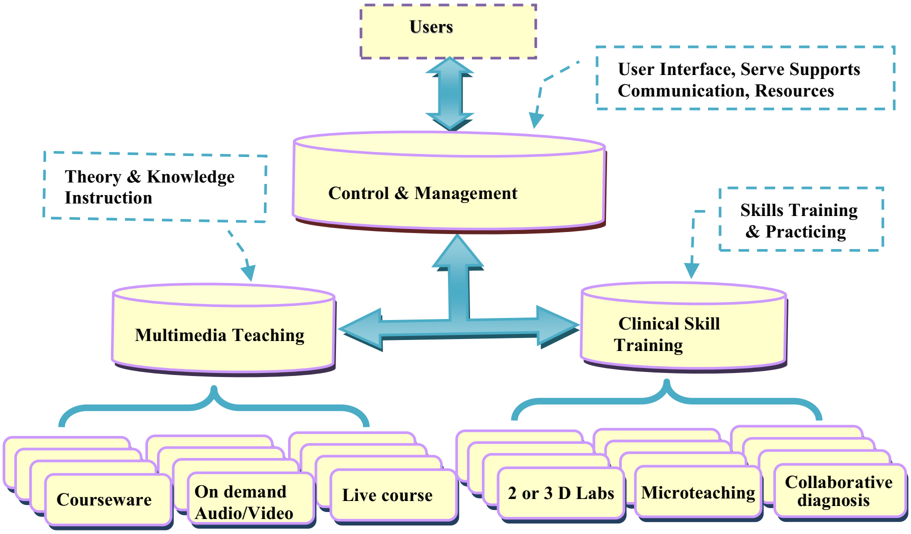

Fig. 4. Platform structure

(3) Clinical skill training

Supporting all function related to clinical skill training and learning, mainly including 2D or 3D virtual reality clinical experiment, routine procedure of the basic skill training, distance collaborative clinical diagnosis, medical consultation, clinical microteaching demonstration, etc. At the same time, it can provide many laboratories, distance diagnosis, microteaching demonstrations, etc. Learners can choose different clinical laboratory for practice and several learners can also select the same lab for skills practice.

3.2 Prototype of the Platform

A prototype of the platform has been developed and tested. After one year running, the prototype successfully reached control and management, multimedia teaching, and training and learning for clinical knowledge and skills. Because of this platform directly aim at the three kinds of training objects in corps, pre-service physicians, corps medical staffs, and division bureau physician, all kinds of personnel can login the platform and take training and learning. Such as medical students can directly login in the platform home page and then select pre-service physician page for carrying out on the required training or learning. The home page of the platform prototype shows in Fig. 5.

Fig. 5. Home page of the platform

Control and management part is to realize the control and management of the platform, including distance medical education and the communication, network center home page of the corps, various service supports, multimedia teaching, training or learning process management, and learning resource management and call, etc. There is a special server and software middleware responsible for the entire operation of the platform. To the users, it is to manage user role and authority so that each role has the corresponding privileges duties. The platform provides flexible access control, can organize several user groups, and each group can set the corresponding privilege. If a learner belongs to one of user group, he/she will have inherited corresponding privilege, but also for each user can set up independently to meet all kinds of special needs.

Clinical multimedia teaching function is core part of the platform. It will directly support teaching for clinical medical theory and knowledge. If the learner clicks on any course button, then can jump to that video or a live course, and at the same time some auxiliary materials are attached. Fig. 6 shows the viewing & emulating..

There are more functions in the multimedia teaching part, such as view and emulating which can be in live teaching, collaborative diagnosis process, and surgery operation, the viewing process can also be in groups and talking with experts.

It is also possible for distance collaborative diagnosis which means "diagnosis interaction between users located in different place can be supported through the Internet site, and share the window to interact in real-time voice and video”. This

Fig. 6. Example of viewing and emulating

Fig. 7. Distance collaborative diagnosis

process lets learners to participate in others cooperative consultation process and improves their diagnosis knowledge and ability. The figure 7 shows an example of distance collaborative diagnosis.

As a clinical skills training platform, how to realize clinically relevant virtual reality experiments is an important function. These experiments include operation routine procedure, basic clinical skills, demonstration microteaching evaluation based on virtual reality 2 or 3D technologies. Distance 3 D virtual surgery training is based on the realization of the function of medical image post-processing, 3D reconstruction technique, vivid experiment scene, experimental environment, learners surgery for virtual operation experiment, through the network to simulate the real operation process. 3D medical image virtual operation experiment provides the user with the default function based on image. When loading on DICOM, click distance 3D virtual surgery icon, choosing the appropriate mode (volume reconstruction, MIP, MPR, slice mode) or the image default to make a person 3D reconstruction volume mode. Learner can also make the image and add it to the template base. Figure 8 shows a 3D virtual reality and reconstruction interfaces.

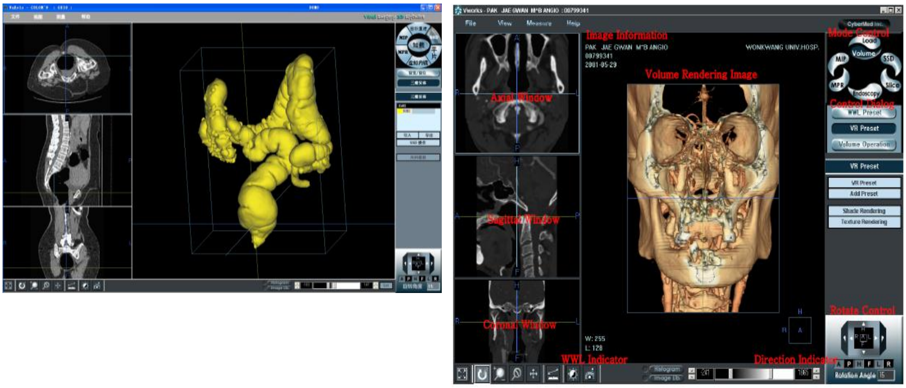

Fig. 8. 3D virtual surgery and reconstruction interfaces

4 Comparative Experiment and Statistical Results

A comparative experiment was done during last semester at the attached hospital of Shi He Zhi University. The experiment is according to the relevant regulations and criteria of clinical medical knowledge and skills. The experiments mainly choose some clinical skills as a training and assessment items.

4.1 Experimental Method and Process

335 students randomly chosen into two different groups: a group as matched group (to self-study way), another group (participate in the training experiments). Two groups will eventually take the examination (after one semester), and then compare students' grades. The result of the random selection was: the matched group for 143 persons, and the experimental group for 192. All students can login distance medical education clinical skills training platform for systematic learning and training. They will each related medical theory knowledge learning, clinical skills video viewing and partial operation of training, summarizes clinical technology analysis skills training and exercise program.

4.2 Experimental Comparative Statistics and Results

Ten skill experiments was involved. According to the test scores, with SPSS13.0 tool statistic and analyzes, the data result compares use the T Value, P Value < 0.05 as the differences. From the statistics The two group results was statistically significant differences, the overall achievement of the experimental group obviously higher than the matched group, the comparative statistics results see table 1. (E Group means experimental group, M Group is matched group).

5 Conclusion

This study aimed at our country distance medical education, combining the characteristics of Xing Jiang Construction Corps medical education and the actual need of the design and implementation of medical students, through in the corps and the actual use of the medical workers, primarily validated the rationality and effectiveness of the platform design. It provides a set of effective clinical skills training, but also the way how to effectively use the Internet to distance medical education for a beneficial exploration.

The clinical skill training in medical education is a continuous development, especially with the developments of new theories, ideas, methods and means. As this study was limited in time and some conditions, still many questions should be further exploration, especially in distance training model, clinical diagnosis, decision-making system, assessment standardization, etc.

Table 1. Experimental comparative result

Skills name	Student number	Group	Average point	Standard deviation	T Value	P Value
venipuncture	17	E Group	93.45	9.50	2.28	<0.05
	11	M Group	84.59	5.98		
belly puncture	23	E Group	82.54	4.49	1.68	<0.05
	22	M Group	88.82	9.84		
liver biopsy	26	E Group	96.79	3.37	2.99	<0.01
	14	M Group	88.28	6.79		
isolation tech.	15	E Group	93.68	9.37	2.56	<0.05
	11	M Group	85.26	5.81		
heart & lung recovery	14	E Group	96.80	5.94	0.76	<0.05
	11	M Group	94.00	5.89		
gastric tube wash stomach	25	E Group	96.79	3.35	2.97	<0.01
	14	M Group	88.28	6.87		
drainage technology	17	E Group	92.45	9.30	2.26	<0.05
	11	M Group	83.18	5.79		
venesection	21	E Group	96.79	9.78	3.65	<0.05
	23	M Group	83.67	5.23		
tumor resection	13	E Group	92.40	5.93	0.76	<0.05
	12	M Group	83.39	5.89		
endotracheal tube	21	E Group	95.39	9.26	2.28	<0.05
	14	M Group	88.30	5.64		

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An Exploratory Study on Instructors' Agreement on the Correctness of Computer Program Outputs

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Abstract. Many universities have developed *Automated Program Assessment Systems* to automate the tasks of assessing students' computer programs so as to enhance students' learning and relieve instructors' workload. These systems typically evaluate the correctness of a program by comparing its actual outputs with the instructor's pre-defined expected outputs. However, an actual output may still be correct even if it deviates from the expected output. One challenge in building such a system is to devise an automated mechanism for determining program output correctness that matches the instructor's own judgment. This is difficult if instructors have different individual judgments. This paper reports an exploratory empirical study which evaluates instructors' agreement on the correctness of students' program outputs. Our study demonstrates reasonably good overall agreement between the instructors and reveals the categories of program output variants for which they are more likely to agree or disagree.

Keywords: automated assessment, instructor agreement, output correctness, program testing, testing design, token pattern.

1 Introduction

In computer programming courses, students have to practise writing programs frequently. Instructors then have to assess students' programs and provide prompt and useful feedback to facilitate students' learning. These tasks are, however, known to be tedious and time consuming. To relieve the workload of instructors and to enhance student learning, many universities have developed *Automated Program Assessment Systems* (APASs) to automate the tasks of assessing students' programs [1, 2].

APASs are particularly helpful in assessing the correctness of students' programs automatically, typically by running tests and then comparing the programs' actual outputs with the expected outputs that were pre-defined by the instructors [3, 4, 5, 6]. However, the solution to a programming exercise may not be unique. Thus, the actual output produced by a student program may still be correct even if it is not exactly the same as the instructor's expected output. We refer to an actual output which deviates from the expected output as an *output variant*, and as an *admissible output variant* (or *inadmissible output variant*) if the instructor considers it to be correct (or incorrect).

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In the software engineering terminology, a mechanism (be it automated or manual) which determines whether a program is correct or not is called a *test oracle*, or simply an *oracle* [7]. For assessment of student programs, instructors would usually prepare, along with the exercise, some test inputs and their expected outputs. The test oracle typically compares the student programs' actual outputs with instructors' pre-defined expected outputs. The comparison is trivial if the actual outputs match the expected outputs exactly and, hence, are correct, but is challenging when they differ. When a human instructor assesses the programs manually and, hence, performs the tedious task of an oracle, there are risks of the judgment being subjective, error-prone, inconsistent and inefficient. On the other hand, when assessment is performed by an APAS, the results are critically determined by its built-in automated oracle.

Devising an automated oracle to match instructors' judgment is highly non-trivial and is one of the big challenges in building APASs. In this regard, it is important to understand how instructors judge the correctness of program outputs manually. In particular, it is not clear to what extent different instructors consistently make the same judgment. To our best knowledge, this problem has not been investigated in the literature, though a related one has been studied in other contexts. For example, Butcher and Jordan [8] compared the accuracy of marking short free-text student responses by different tutors with that by a computerised marking system called IAT. They found the marking of all markers (including IAT) indistinguishable at the 1% level for four of the seven questions, but significantly different for the other three questions. In some cases the differences of mean mark between human markers were large. However, such findings are not useful in the design of APASs, as the assessment of free-text responses is probably more subjective than that of program outputs.

This paper reports an empirical study which addresses three research questions:

1. To what extent do instructors have difficulty in deciding whether a program output variant is admissible or not?
2. To what extent do different instructors agree on whether students' program output variants are admissible or not?
3. What categories of program output variants are instructors more likely to agree or disagree on their admissibility?

The main contributions of this research work are summarized as follows.

- Our research work is a first attempt to compare the assessment of program output variants by different instructors. To our knowledge, this is the first peer-reviewed report of an empirical study on this issue.
- Our study provides preliminary statistical evidence of reasonably good overall agreement between instructors on the correctness assessment of output variants.
- Our analysis reveals the categories of program output variants for which instructors are more likely to agree or disagree, which may be useful in the design of APASs.

The rest of this paper is organized as follows. Section 2 elaborates on the issues of handling program output variants. Section 3 outlines the setting of the present empirical study. Section 4 presents and analyzes the results. Section 5 concludes the paper.

2 Program Output Variants

Instructors usually provide many exercises for students to practise writing programs. Each exercise typically consists of a brief description (*specification*) of the program requirements, with input and output sample(s) as reference. Generally, a specification may be implemented by coding the program in different ways, depending on the programmer's style, preference, techniques used and interpretation of the requirements.

Consider, of example, a simple adder program which adds two input numbers and produces their sum as output. When the input numbers are `10` and `8`, their sum is of course unique, that is, `18`. In the interest of good programming practice, however, the instructor may prefer students to write the program in such a way as to produce a "more informative" output, such as "`Sum = 18`". With this intention, the instructor may specify the two numbers `10` and `8` as sample input and "`Sum = 18`" as the corresponding expected output. Although most students will correctly write programs that produce exactly the required output, our experience is that there are usually a non-trivial number of students whose programs produce outputs that deviate from the expected outputs. As mentioned earlier, we refer to such outputs as *output variants*.

Some output variants are clear symptoms of misunderstanding the requirements or other mistakes made by the student. For example, the output "`Average = 9`" may be due to misunderstanding the program requirements to produce an average instead of a sum, while the output "`Sum = 80`" is probably caused by the mistake of using the wrong multiplication operator instead of addition. Such output variants are certainly inadmissible and, hence, should be *rejected* as incorrect.

On the other hand, many output variants are admissible and so should be *accepted* as correct. For example, blanks are notoriously invisible and punctuation marks or letter cases are commonly ignored when reading computer outputs. Thus, some students may write programs that produce outputs such as "`Sum=18`" (with no blank), "`Sum = 18.`" (with an appended period) or "`sum = 18`" (with lowercase "`s`"). To most instructors, it is quite obvious that these students are able to code the program to do addition and, hence, have achieved the main learning objective of the exercise, even though the outputs deviate slightly from the expected. While some instructors may insist that these programs are incorrect, many others are not concerned with these "minor deviations" and, hence, consider these programs to be correct.

By performing exact match of the actual and expected outputs, it is straightforward for an automated oracle to satisfy the need of instructors who insist on strict conformance of outputs. However, experience shows that students easily get frustrated in their learning if penalized by these "trivial" mistakes. Many students do not admit such "minor deviations" as their own "mistakes", but would complain that they are "unfairly treated" by the unreasonably strict correctness criteria of the APAS [1, 5].

A common avoidance strategy adopted by instructors is to tighten the specification and explicitly disallow any output deviation, however "minor" [4]. Such a specification often contains unnecessarily lengthy additional output format requirements [9], which easily distract students from the exercise's main learning objective. Moreover, while this strategy may minimize complaints, it actually often increases frustration, as student programs are more likely to violate the additional requirements [10, 11].

To satisfy the need of instructors who are tolerant of "minor deviations" of output, many APASs include simple comparison rules in its automated oracles [1]. The most common rules are to ignore all whitespaces or letter cases in program outputs [4]. For example, the *Programming Assignment aSsessment System* (PASS) [5], an APAS developed in our university, allows the instructor to select from several options, such as to ignore letter cases, remove all blank lines, or reduce all consecutive whitespaces to one, etc., before performing output comparisons [5]. Such rules, however, cannot solve all problems caused by minor output deviations. For example, PASS cannot properly handle the admissible output variant "`Sum = 18.`" which has an extraneous period "`.`" at the end. It is obviously impractical to ignore all "periods", or else the output "`Sum = 18.0`" will be indistinguishable from "`Sum = 180`".

Many other strategies have been used in practice to address the output variant problem, as revealed in a recent survey [11]. In particular, Tang et al. [6] recently propose an output comparison approach based on refinement of outputs into tokens. An advantage of the approach is that the token patterns may be configured to suit individual needs. One design challenge is how such configurations can be done to match the instructors' own judgment. This partly motivates the present study.

Furthermore, to better understand the characteristics of common admissible output variants, Tang et al. [10] have examined a large number of output variants that were rejected by PASS but nonetheless manually judged to be acceptable as correct. Their analysis results in the following classification of admissible output variants: (1) *typos* – such as misspelling of words, (2) *equivalent words* – different words of the same meaning, (3) *numeric precision* – numbers of different precisions, (4) *presentation* – spacing and visual formatting of output items, (5) *ordering* – different arrangements of output items, and (6) *punctuation marks* – having extra/missing punctuations. The classification provides a handy framework for studying instructors' agreements of categories of output variants. It is not clear, for example, whether instructors would more likely agree or disagree on the correctness of certain categories of variants than others. As such, we performed an empirical study to further investigate these issues.

3 The Empirical Setting

PASS has now archived a large number of student program submissions from several introductory courses on C or C++ programming, which were compulsory for all computer science and most engineering students. To meet the huge student demand, such courses, each enrolled by hundreds of students, were offered every semester and taught by a team of instructors. Many programming problems in PASS were shared and reused among instructors. Thus, a bank of programming problems, test cases, students' submitted programs and the assessment results, were kept in PASS. Each result includes input, expected output, actual output of the student program, and the verdict by PASS (correct/incorrect). According to the intended learning outcomes, topics and difficulty levels, we extracted 8 exercises across several courses for study. Together they cover most of the core aspects of elementary programming courses, such as basic input/output/arithmetic operations, control flows, and output formatting.

Fig. 1 shows one of the extracted exercises, Ex1, with its problem description (specification), (sample) input and expected output. Below these, each row in Fig. 1 shows a sample of the output variants rejected by PASS. On the right side of these rows, we constructed 5 columns and labelled them 1 to 5, respectively. Columns 1 and 2 were also labelled "A" (which stands for "Accept"), column 3 was labelled "N" (which stands for "Neutral"), and columns 4 and 5 were labelled "R" (which stands for "Reject"), respectively. For each extracted exercise, we made up a survey form in the format as shown in Fig. 1. The respondents were requested to choose exactly one from the 5 columns of each row to indicate whether they would accept ("A", that is, choose column 1 or 2), be undecided ("N" for neutral, that is, choose column 3), or reject ("R", that is, choose column 4 or 5) the output variant of the row.

We made up a survey form for each of the other 7 exercises in a similar manner. Owing to the limit of pages, here we only show Ex1 and its output variants in Fig. 1 as an illustration.

We extracted only those results rejected by PASS but possibly considered admissible by human assessors. Outputs which are doubtlessly incorrect were dropped. For example, if the area calculated by a program for the sample input of Ex1 is a blank or "`0.00`", obviously this value bears no similarity to the expected output "`4.00`" and, hence, the actual output is doubtlessly inadmissible. So this output variant was excluded from our study. But if the calculated area is "`4`" (output variant 10 in Fig. 1), even though its precision is different from that of the expected output, the instructor may still consider the actual output admissible. So this output variant was included.

Frequently, a large set of output variants were very similar. For instance, when there was a typo in the output text of a program's print statement, whatever the print values were, the typo would be repeated whenever that statement was executed. From each of these sets, we picked only one representative sample. Subsequently, a sample of 14 output variants was identified for Ex1 as shown in Fig. 1. Overall, a total of 111 output variants among 8 exercises (named Ex1–Ex8) were extracted in this study. All the 111 output variants of the 8 exercises were presented on the survey forms to two instructors (hereafter referred to as Instructors A and B) separately. They were then requested to record independently their own judgment of whether each of the variants was admissible or not. Both instructors had been teaching these programming courses for many years and had solid experience in marking similar student programs. They were therefore well suited as human subjects in this survey study.

4 Data Analysis and Results

Both instructors completed all items in the survey forms. In this section, we analyze their responses to answer the three research questions posed in Section 1 one by one.

4.1 Deciding Output Correctness

The first research question is: *To what extent do instructors have difficulty in deciding whether a program output variant is admissible or not?*

In this study, Instructor A considered 89 of the output variants admissible and the other 22 inadmissible. Instructor B considered 85 output variants admissible, 20 inadmissible, and 6 undecided. That is, Instructor A had no difficulty at all whereas Instructor B could not decide on the correctness of 6 out of all 111 output variants.

Problem Description:

Ex1. Maximum triangle area

Construct a program to compute the largest triangle among a group of points. User will enter *n* (3 ≤ *n* ≤ 15) followed by *n* points each having a position *x*, *y*. Assuming all points are valid, a number of possible triangles will be formed. Compute and output the largest triangle (print out the area measure to 2 decimal places and the position of those 3 points). In the case when there are more than 1 triangle having the same maximum area, output the first available triangle.

Input:	`7` `1,1 3,1 5,1 2,2 4,2 3,3 7,3`
Expected Output:	`(1,1) (5,1) (3,3)` `area: 4.00`

	Actual Outputs (Output Variants)	**A**		**N**		**R**
		1	**2**	**3**	**4**	**5**

1	`(1, 1) (5, 1) (3, 3)`
	`area: 4.00`
	
	(two trailing newlines)					

2	`(1, 1) (5, 1) (3, 3)` `area: 4.00`					
3	`(1,1) (5,1) (3,3)` `area : 4.00`					
4	`(1,1) (5,1) (3,3)` `area :4.00`					
5	`(1,1)(5,1)(3,3)` `area: 4.00`					
6	`(1,1) (5,1) (3,3)` `4.00`					
7	`(1,1) (5,1) (3,3)` `Total area: 4.00`					
8	`(1,1) (5,1) (3,3)` `max: 4.00`					
9	`(1,1) (5,1) (3,3)area: 4.00`					
10	`(1,1) (5,1) (3,3)` `area: 4`					
11	`area: 4.00`					
12	`(5,1) (3,3) (1,1)` `area: 4.00`					
13	`(1,1) (5,1) (3,3)` `area: 4.00Press any key to continue..`					

14	`(1,1) (5,1) (3,3)`
	`area: 4.00`
	`formed by:`					

Note: **A** *denotes "Accept",* **N** *denotes "Neutral", and* **R** *denotes "Reject".*

Fig. 1. A sample exercise used in this study

Three output variants which Instructor B could not decide occurred in Ex2. Ex2 requires the program to output the type of a triangle given its three lengths as input. When the input lengths cannot form a triangle, the expected output is "`impossible`", but there were output variants like "`incorrect input \nimpossible`" (where '`\n`' denotes the newline character), "`Please input positive numbers!`" and "`This is not a triangle`". Instructor A accepted all these variants but Instructor B could not decide. Another instance occurred in Ex6 where the expected output has four lines, each with two integers separated by a colon. One variant deviates from the expected output only in missing the colon in the last line. Another variant misses all newline characters, merging the numbers in consecutive lines together. Instructor A accepted these two output variants, whereas Instructor B was undecided. A third instance occurred in Ex7 which expects the output "`total: 7`". Instructor A rejected the variant "`total: 3\ntotal: 7\ntotal: 7`", presumably because of the first incorrect total, but Instructor B hesitated as the correct total value was actually also computed and presented (twice)! All in all, considering both instructors together, the percentage of undecided cases was only 2.7% (= 6/222), which is relatively small.

4.2 Agreement between Instructors

The second research question is: *To what extent do different instructors agree on whether students' program output variants are admissible or not?*

In experiments or surveys, different *raters* may disagree with the results of rating or measuring the same target due to many factors, such as individual's bias and variations in result interpretation. Evaluation of *inter-rater reliability* refers to statistically measuring the degree of agreement among raters [12] (the instructors in our study). Since such measures typically apply to binary decisions, from hereon we analyze only the 105 output variants which both instructors made clear accept/reject decisions.

Consider the summary of decisions on Ex5 listed in Table 1. It shows that 7 output variants were accepted and 2 rejected by both instructors, while they disagreed on the other 2. Thus, they agreed on 9 cases (7 accept plus 2 reject) out of 11. Naturally, it suggests an intuitive and simple measure of degree of agreement, commonly known as the *agreement probability*, P_a. For Ex5, $P_a = 9/11$ or 81.8%, which is quite high.

Simple and intuitive as it is, P_a is also least robust as it takes no account of error of "agreement by chance", P_e, due to the limited options available to raters. Most other measures estimate P_e based on a model of how chance and error affect raters' decisions and adjust P_a by P_e. Such a measure should be close to 1 when the agreement is perfect, and close to 0 (or −1 in some measures) when there is no "intrinsic" agreement. The common chance-corrected measures of inter-rater reliability are Cohen's *Kappa* statistic [13], Scott's *Pi* statistic [14] and recently Gwet's *AC1* statistic [15]. Table 1 shows that their values for Ex5 are 0.542, 0.542 and 0.699, respectively.

Kappa and Pi statistics are closely related and widely used in reliability measurements. Landis and Koch [16] propose to interpret Kappa statistics in the way shown in Table 2. Accordingly, the value 0.542 for Ex5 indicates "moderate agreement" among the two instructors. However, Landis and Koch's interpretation was based purely on their personal opinion and lacks evidence to support its soundness [12].

Table 1. Summary of decisions on Ex5 and the computed inter-rater reliability measures

		Instructor B			Inter-rater reliability measure			
Instructor A		Accept	Reject	Total	P_a	*Kappa*	*Pi*	*AC1*
Ex5	Accept	7	1	8	0.818	0.542	0.542	0.699
	Reject	1	2	3				
	Total	8	3	11				

Table 2. Landis and Koch's interpretation of Kappa statistics [16]

Kappa statistic	**Interpretation**
< 0	Poor agreement
0.01 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 1.00	Almost perfect agreement

Both Kappa and Pi statistics are well known to possibly result in overestimation of P_e and, hence, underestimation of the "true" inter-rater reliability in many circumstances. Consider Ex7 in Table 3, in which instructors agreed on 14 output variants and disagreed on the other 3 variants, giving a value of P_a (0.824) slightly higher than that (0.818) for Ex5. However, the Kappa and Pi values for Ex7 are 0.000 and –0.097, respectively, far lower than those (0.542 and 0.542) for Ex5, with no obvious intuitive reason why the degree of agreement estimated by the two statistics for Ex7 is so low. This phenomenon, known as the *Paradox of Kappa* [12, 15], is also observed when comparing Ex7 with Ex8 in Table 3, where the P_a value of Ex7 is 0.157 higher but its Kappa and Pi values are about 0.270 lower than those of Ex8.

Gwet [15] recently developed the AC1 coefficient to overcome the underestimation problems of Kappa, Pi and some other measures. Indeed, Table 3 shows that AC1 is generally consistent with P_a. This study computed all four measures to provide a balanced analysis, as shown in Table 3, for all the 8 exercises.

Although there is no well-established means for interpreting the figures in Table 3, we can still make some general observations. First, the instructors had undoubtedly the highest agreement for Ex2, for which they always made the same decisions. At the other extreme, they seemed to agree least on Ex8 according to P_a (0.667) and AC1 (0.443), or Ex3 according to Kappa (0.000) and Pi (–0.111). But they still achieved fair agreement on Ex8 according to Landis and Koch's interpretation of Kappa statistics (0.270), whereas for Ex3 the values of P_a (0.800) and AC1 (0.756) can hardly be said to be low. In short, while there are certain signs of high or substantial agreement for some exercises, we found no strong evidence of poor agreement for any exercise.

The "overall" degree of agreement between the instructors may be evaluated in two ways. First, we computed the average of the inter-rater reliability measures over all 8 exercises. The average P_a, Kappa, Pi and AC1 values are, respectively, 0.807, 0.327, 0.284 and 0.710, as shown in the row just below that of Ex8 in Table 3. While the Kappa statistic indicates fair agreement according to Landis and Koch's interpretation in Table 2, both P_a and AC1 show substantial or high degree of agreement.

Table 3. Summary of data analysis on all exercises

Instructor A		Instructor B			Inter-rater reliability measure			
		Accept	Reject	Total	P_a	*Kappa*	*Pi*	*AC1*
Ex1	Accept	11	1	12	0.786	–0.105	–0.120	0.735
	Reject	2	0	2				
	Total	13	1	14				
Ex2	Accept	19	0	19	1.000	1.000	1.000	1.000
	Reject	0	4	4				
	Total	19	4	23				
Ex3	Accept	4	0	4	0.800	0.000	–0.111	0.756
	Reject	1	0	1				
	Total	5	0	5				
Ex4	Accept	4	0	4	0.857	0.696	0.689	0.736
	Reject	1	2	3				
	Total	5	2	7				
Ex5	Accept	7	1	8	0.818	0.542	0.542	0.699
	Reject	1	2	3				
	Total	8	3	11				
Ex6	Accept	6	1	7	0.700	0.211	0.200	0.520
	Reject	2	1	3				
	Total	8	2	10				
Ex7	Accept	14	0	14	0.824	0.000	–0.097	0.790
	Reject	3	0	3				
	Total	17	0	17				
Ex8	Accept	10	6	16	0.667	0.270	0.169	0.443
	Reject	0	2	2				
	Total	10	8	18				
				Average	0.807	0.327	0.284	0.710
All	Accept	75	9	84	0.819	0.424	0.424	0.736
	Reject	10	11	21				
	Total	85	20	105				

Secondly, we analyzed all output variants as a whole set, as shown in the sub-table (labelled "All") at the bottom of Table 3. A total of 75 output variants were accepted and 11 rejected by both instructors, while they disagreed on 19 output variants. The values of P_a, Kappa, Pi and AC1 are, respectively, 0.819, 0.424, 0.424 and 0.736. This time, the Kappa statistic indicates moderate agreement according to Landis and Koch's interpretation, while P_a and AC1 again show substantial agreement.

4.3 Categories of Output Variants versus Instructors' Agreement

The third research question is: *What categories of program output variants are instructors more likely to agree or disagree on their admissibility?*

To answer this question, we manually examined the output variants, categorized them by their characteristics, and tabulate them in Table 4 according to (1) their categories, and (2) whether the instructors agree on their correctness or not.

Table 4. Agreement of output variants by category

Agreement / *Category*	**Ex1**		**Ex2**		**Ex3**		**Ex4**		**Ex5**		**Ex6**		**Ex7**		**Ex8**		**All**	
	A	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**
Typo			6		1		1		4		1		1				**14**	
Different words	1		3														**4**	
Numeric precision	1														1	6	**2**	**6**
Presentation	6						2	1	1		3	1	7		6		**25**	**2**
Ordering	1								1			1					**2**	**1**
Punctuation marks			3						2				1				**6**	
Missing element	*1*	*1*			*1*		*2*	*1**		*1*		*1*	*1*		*2*		***7***	***4***
Extra element	*1*	*2*	*14*		*2*	*1*	*2*	*1*	*1*	*1*	*3*	*1*	*5*	*3*	*3*		***31***	***9***

Note: *(a)* **A** *denotes "Agreement" while* **D** *denotes "Disagreement" between the instructors.*
*(b) * – an inadmissible output variant that was wrongly included in the survey form.*
(c) Each output variant may fall in more than one category.

Earlier in Section 2 of this paper, we mentioned the classification framework of admissible output variants by Tang et al. [10]. In this work, however, some output variants under study were *admissible* but some were *inadmissible*. In fact, when the instructors disagree, the same output variant was admissible to one but inadmissible to the other. In the process of categorizing the output variants, we noticed unsurprisingly that there were generally more variations among inadmissible variants than among admissible variants. Specifically, in addition to those listed in [10], we had to include two more categories, namely "*missing element*" and "*extra element*". The "*missing element*" category consists of variants which omit one or more "non-visual" elements in the expected output. By "non-visual" elements, we refer to those *not* related to formatting or visual presentation, whereas formatting characters such as whitespaces are considered "visual" elements. Moreover, we generalized the category of "*equivalent words*" into "*different words*". This is because a word in an *admissible* output variant which differs from the corresponding word in the expected output is usually equivalent to the latter (or else the variant may not be admissible), but is usually not equivalent to the latter when the former word is in an *inadmissible* output variant.

As an illustration, consider Ex1 in Table 1 again. The output variants 1–5 and 9 were classified into the *presentation* category. Variants 8, 10, 12 were classified into the categories of *different words*, *numeric precision* and *ordering*, respectively. Both variants 6 and 11 were classified into the *missing element* category, while variants 7, 13 and 14 were classified into the *extra element* category. Generally, a variant may belong to more than one category. Also, the number of variants in this study was not directly proportional to their actual occurrence frequencies in student programs.

We observed from Table 4 that both instructors agreed on all variants in the *typo*, *different words* and *punctuation marks* categories. They also usually agreed on (25 out of 27) variants in the *presentation* category. On the other hand, they disagreed (frequently) on 6 out of 8 and 1 out of 3 variants, respectively, in the *numeric precision* and *ordering* categories. For variants in the *missing elements* and *extra elements* categories, no clear conclusion can be drawn, as whether the instructors agreed or not highly depended on what these (missing or extra) elements were.

One output variant, highlighted with an asterisk in Table 4, is worth mention here. Ex4 specifies a program to generate the calendar of a month. The expected output is a tabularized calendar of 7 columns. each corresponding to a day of the week. We mistakenly extracted a variant which missed a calendar day (and, hence, belonged to the *missing element* category) into the survey form. The variant is undoubtedly inadmissible and, therefore, should not be included in this study. Interestingly, one of the instructors also misread the variant and (wrongly) considered it admissible (which was, unsurprisingly, *disagreed* by the other instructor). This instance reveals an obvious limitation of a human oracle: human beings are prone to errors. Indeed, it is very unlikely for an automated oracle to make a wrong verdict on this output variant.

4.4 Summary of Findings

We now summarize our empirical findings on each research question as follows.

1. Among all 111 output variants assessed by the two instructors, only one instructor was undecided on 6 variants, a very small portion of all variants. We conclude that they did not have much difficulty in deciding the admissibility of output variants.
2. The probability of agreement between the two instructors' judgment ranges from 0.667 to 1, with an average of 0.807. After adjustment by the probability of error due to coincidental agreement, the average AC1 value is 0.710. The two measures indicate substantial agreement. While the Kappa and Pi statistics indicate fair to moderate agreements only, they suffer from the "Paradox of Kappa" and are prone to significant underestimation of the true inter-rater reliability [12, 15]. All four statistics, taken together, indicate fair to high degrees of agreement. Therefore, we conclude that the results show reasonably good agreement between the instructors.
3. In this study, the instructors fully agreed on all variants in the *typo*, *different words* and *punctuation marks* categories, and often disagreed on variants in the *numeric precision* and *ordering* categories. When variants had *missing* or *extra element(s)*, the agreement of instructors depends on what the missing or extra elements are.

5 Conclusion and Further Work

A key challenge in building a student program assessment system is the design of an automated test oracle that determines the correctness of students' programs. Ideally, the oracle should match instructors' judgment, which would be difficult if different instructors disagree among themselves. In this work, we empirically study the degree of agreement between instructors on the correctness of program outputs. The results are encouraging, showing reasonably good overall agreement between the instructors. Constrained by the available time and resources in this study, the sample consists of two human subjects only, which is too small for the results to be generalized. Further work is necessary to extend the empirical setting to a larger sample size of instructors so that higher statistical power of the results can be obtained. Further analysis is also needed to identify the factors affecting instructors' judgment and their implications to the technical design of test oracles in automated program assessment systems.

Acknowledgments. This work is supported in part by a grant (project no. 7002873) from City University of Hong Kong. The authors wish to thank the participants of this empirical study.

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The Design and Performance Evaluation of Hybrid School-Based Training

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Abstract. To resolve the issue that school-based training's being low-quality and low-efficiency, the author proposed an improved design model, hybrid school-based training (HSBT), and has put it into practice in 100 high schools involving 1100 teachers in Hebei, Henan, Liaoning, Anhui provinces of China mainland from September to December, 2011. This paper introduces the design model of HSBT, and explains the performance evaluation results obtained by content analysis, video case analysis and statistical analysis methods. It can be concluded that this HSBT has changed teacher training's paradigm, and has supported teachers' professional development well; moreover, it is suggested that more professional learning assistants are needed to provide services for teachers' professional development.

Keywords: hybrid learning, school-based training, training paradigm, performance evaluation.

1 Introduction

In-service teachers' professional learning and training have many questions and challenges. Dufour Richard (2004) pointed out that teachers' professional learning faces three challenges and has seven problems. The challenges are: (1) developing and applying shared knowledge, (2) sustaining the hard work of change, (3) transforming school culture. The problems are actually the clashing themes about teachers' professional learning: (1) learning for all versus teaching for all, (2) collaborative cultures versus teacher isolation, (3) collective capacity versus individual development, (4) a focus on results versus a focus on activities, (5) assessment for learning versus assessment of learning,(6) widespread leadership versus the charismatic leader, (7) self-efficacy versus dependency (Dufour, 2004).

To resolve the challenges and problems mentioned above, a new professional learning method for in-service teachers called school-based training (SBT) showed up in mainland China. SBT is a form of teachers' continuing education in aim of promoting teachers' professional development. Its main base is elementary or secondary school and teachers do the research according to their own needs of professional development to improve their professional literacy. Its basic unit is a SBT team, and its core activity is resolving the actual problems happened in teaching practices. The SBT has the

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 81–89, 2013.

following key characteristics: the training base is school-based, the training subject is actually school-based teaching or learning problem, the training goal is improving teachers' professional literacy for professional development, and the learning method is group learning (Wang & Zhang, 2012). However, after years' practice, it is found that SBT, a professional learning form for in-service teachers, has many problems. Due to the reasons: (1) the lack of expert's guidance, (2) the deprivation of training resources, (3) training content is unrelated to the school context, (4) hard to cultivate SBT group, (4) the lack of effective managing and evaluating systems, the quality of SBT is normally very low, and teachers are always complaining about it (Wang, Gong & Zhao, 2010).

Aiming to deal with the problems mentioned above, the author proposed a HSBT plan, which is a mix of face-to-face training and distance SBT. This plan aims to transform the existing SBT model from two parts: hybrid design of learning environment and hybrid learning activities. The proposal was highly recommended and strongly supported by the Department of Teacher Education, Ministry of Education, China mainland. It has been put into practice in 100 high schools in Hebei, Henan, Liaoning, Anhui provinces for 4 months. Firstly, each high school selected one "seed" teacher as the leader of SBT group, to attend 15-day face-to-face training in Capital Normal University, Beijing. Secondly, "seed" teachers went back to their schools to train 10 same-subject teachers to develop their own SBT groups. After that, all the training groups took 3.5-month training via an online platform for SBT.

2 Literature Review

2.1 Barriers to Teachers' E-Learning

It is known to all that, there are a lot of barriers to e-learning. From the perspective of the quality of learning outcomes of e-learning, the barriers can be classified into four kinds: learners, teacher, curriculum, and school (Assareh & Hosseini, 2011). Based on the literature review and personal empirical experience, five categories of potential online learning barriers are identified: technology, online communication with teacher, online communication with peers, electronic text based study materials and online learning activities (Simuth & Sarmany-Schuller, 2010).

Teachers' e-professional-learning is harder and more challenging than normal e-learning. The reason is that teachers' professional learning is aim to develop their practical knowledge, which is apparently practical. Because of practical knowledge's tacit attribute, it is hard to be captured. Thus, the learning processes of practical knowledge, such as communicating, capturing and constructing are obviously different from the ones of explicit knowledge (Leonard & Sensiper, 1998). Teachers' knowledge is dynamic, and it is continually in motion. With the improvements on the needs for professional development, their collective knowledge is changing at an accelerating rate (Wenger, 2002).

It is pointed out that, the existing teacher trainings are merely web-based trainings. Thus, they only focus on teachers' learning content, and the systems are driven by delivering learning content. The systems are individual-centered. Possible few interactions can only happen between learners and the guide, and learners have no contact with each other. Thus, without providing teachers teaching skills as well as scaffolds to apply theoretical concepts, it is hard to form a real community for professional development (Robin, 2002). Therefore, in order to design HSBT, the first problem to tackle is that, we should construct bridges between teachers' actual working environment and their learning. We should design offline activities based on teachers' positions and online learning activities for teachers, which will altogether clean the barrier that teachers' e-learning is unrelated to their actual working context.

2.2 The Cycle of Experiential Learning Theory

Experiential learning means a process of transforming experience and creating knowledge. This kind of learning gives experience a central role in the process of learning. David Kolb, a famous American educator, advocated cycle of experimental learning (CEL) theory based on the experimental learning models of John Dewey, Kurt Lewin, Jean Piaget. In this theory, learning starts from people's concrete experience. A complete learning process includes four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984; Kolb & Kolb, 2008).

Teachers' learning is a kind of experimental learning. Teachers' experimental learning is a process of updating their own knowledge, thoughts, and experiences based on their existing experience, that is, a process of gaining knowledge and skills based on their own experience. The first stage of CEL is gaining concrete experience, which has typical characteristic of experiencing learning. In this stage, teachers should bring questions to the experience context with a view of researcher, and gain real direct experience related to physical instructional activities in instructional practices. The second stage is reflective observation, which has typical characteristic of reflective learning. In this stage, teachers should observe and think about the concrete experience gained in the first stage based on their experience, knowledge, and theories, and then find the relations between concrete experience, and relationships between practical activities and results. The third stage is abstract conceptualization, which has typical characteristic of generalizing learning. In this stage, teachers should analyze the data they collect from stage 2, summarize the methods and experience they are having and thinking about, find out relationships between behaviors and results in concrete contexts, and then generalize the methods and patterns of teachers' instructional behaviors in class to reasonable understandings. The fourth stage is abstract conceptualization. In this stage, teachers should actively apply the practical knowledge and wits generalized in stage 3 into new contexts, as well as intervene during the practicing process to test the conclusions drawn on stage 3 are right or wrong. After that, teachers will internalize new experience through practical activities, which will be the start of next reflection. By going through this cycle, teachers will have effective professional learning.

3 The Design of HSBT

The goals of HSBT are: effectively resolving the problems of school-based trainings' low quality and low efficiency; improving the quality of school-based training from two dimensions, the increasing of practical knowledge and the improvement of practical instructional activities in class.

The design of hybrid learning environment is the foundation of HSBT. For teachers, classroom is not only a room for work-based professional learning, but also a powerful learning context (Putman & Borko, 2000). Therefore, the first goal of HSBT is to focus on learners' comprehensive levels, thinking quality, action improvement and the process in actual practical context. Therefore, a key factor to HSBT is the effective connection between teachers' workplace and online learning environment. The automatic recording system in automatic recording classroom can support teachers to selectively record their own instructions in class easily. After that, they can upload recordings to SBT's online platform, which can connect real class with online school-based learning space.

The hybrid learning activity design based on the CEL is an important guarantee for HSBT. The accomplishment of the cycle's each stage should be based on different learning activities. For example, on the stage of gaining concrete experience, activities are mainly classroom practice and observation, and the goal is to find out problems in instruction; on the stage of reflective observation, activities are case analysis and instruction reflection, and the goal is to analyze the problems; on the stage of abstract conceptualization, activities are peer coaching and expert guiding, and the goal is to tackle the problems; on the stage of active experimentation, activities are heterogeneous classes and learning by doing, and the goal is to solve the problems. Thus, the CEL of hybrid learning activity has three levels: (1) problem solving level, including finding out, analyzing, tackling, and solving problems; (2)

Fig. 1. The design model of HSBT

training activity level, including four kinds of typical training activities: classroom practice and observation, case analysis and instruction reflection, peer coaching and expert guiding, heterogeneous classes and learning by doing. The design model of HSBT is shown in figure 1:

It can be seen from figure 1 that in the model, training activity level is the support level, which connects problem solving level to the top and learning stage level to the bottom,. Training activities fully represent hybrid learning's features. From the perspective of activity subject, the activities can be classified into individual learning activities and group ones; from the perspective of environment, activities can be classified into online learning activities and offline ones; from the perspective of learning style, the activities can be classified into formal learning activities and informal ones; The model shown in figure 1 also contains 2 typical dimensions on teachers' learning and development. The process from "finding out problems" to "tackling problems" makes the first dimension, gaining teachers' practical knowledge. And the process from "analyzing problems" to "solving problems" is the second dimension.

4 Data Analysis and Discussion of Performance Evaluation

4.1 Collect Performance Data and Analysis Methods

To evaluate the validity of HSBT, we collected the data of 1100 teachers from 100 high schools in 4 provinces on four learning stages, which are gaining concrete experience, reflective observation, abstract conceptualization, and active experimentation. We collected their training summative reports; their posts on the online platform for school-based training; randomly selected 68 teachers who have uploaded at least 1 class video during gaining concrete experience, reflective observation, and active experimentation stages, and collected their 204 videos; as sampling rule 10 students per school, 1000 students who took the participating classes were selected to answer the questionnaire.

The validity of HSBT should be evaluated from two dimensions: the increase of participating teachers' practical knowledge and the improvement of their practical instructional behaviors. Thus, we used content analysis, video case analysis, and statistical analysis methods to evaluate its validity. Content analysis is used to analyze questionnaire, interview materials, interactive text on online platform, instructional design documents, and teachers' practical knowledge in reflection diaries; Video case analysis is used to analyze teachers' instructional behaviors and corresponding practical knowledge reflected in class video cases; Statistical analysis is used to generally process quantitative data and find out inherent laws in it.

4.2 Results and Discussion of Performance Evaluation

The design objectives of HSBT are evaluating from two dimensions: the increase of participating teachers' practical knowledge and the improvement of their practical instructional behaviors.

First dimension: the increase of participating teachers' practical knowledge. Teachers' practical knowledge is a kind of cognition which can guide teachers' instructional practice, a kind of personal knowledge on "how to teach" which exists inside teachers' heads, a kind of tacit knowledge which is context-based and case-based. The increase of practical knowledge can effectively improve teachers' class regulation and management skills. We content analyzed all the summative reports and posts collected, and calculated each school's practical knowledge score, as shown in figure 2.

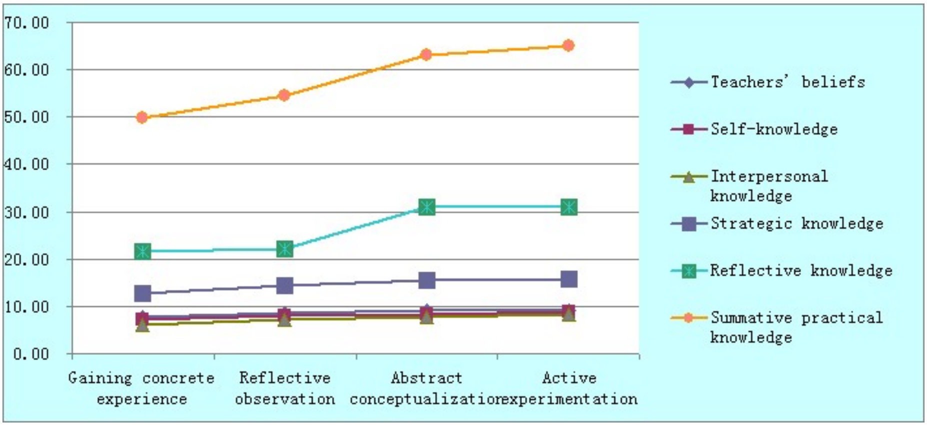

Fig. 2. The development and change of teachers' practical knowledge

It can be inferred from figure 2 that, during online SBT, the practical knowledge of participating groups from 4 provinces was increasing. And their levels of reflective knowledge and strategic knowledge are higher than others'. It can be concluded that online SBT has apparently helped teachers' development and increased their practical knowledge.

Second dimension: the improvement of their practical instructional behaviors. Teachers' instructional behaviors in class affect and determine the instructional quality. Verbal activity is the major explicit instructional activity in classroom, which accounts for around 80% of all the activities (Flanders, 1970). Verbal activity provides enough samples for the research on classroom activity, which can represent or define the instructional activities of a whole class to a large extent (Wang & Liu, 2008). We did coding system analysis and semiotic system analysis on verbal activities in class from three dimensions; dialogue activities, question type and instructional model, and this online school-based training's influences on instructional practical activities' improvements are explained as bellows:

(1) Dialogue activities in classes have significantly changed, and their inaction depths are deeper

The author used coding system analysis method to analyze the dialogue activities of 204 sampled class videos, and obtained typical behavioral data on teacher's question-selecting way, student's answering way and teacher's replying way during gaining concrete experience, reflective observation, and active experimentation stages. After using Mann-Whitney U method to test the difference between 2 independent samples, it can be concluded that, with 95% confidence interval, student-centered dialogue activities in class such as teacher's encouraging students to ask questions, teacher's requiring students to report after discussion, and teacher's positive reply to students have remarkably changed during concrete experience and active experimentation stages.

The performance evaluation results have shown that, the dialogue activities in classes from 4 provinces during three stages have indeed changed. As training goes by, the interactive depth in class is increasing: more teachers' question-selecting activities are encouraging students to ask questions and let hand raisers speak, more students' answering activities are reporting after discussion and individual replying, more teachers' replying activities are giving positive replies and explanations.

(2) Activities of selecting types of question used in classes have significantly changed, and more creative and critical questions were used.

By referring to 4MAT model advocated by McCarthy (Palmer, 2005), the author used coding system analysis method to analyze the question types set in 204 sampled class videos, and obtained question type data during gaining concrete experience, reflective observation, and active experimentation stages. After using Mann-Whitney U method to test the difference between 2 independent samples, it can be concluded that, with 95% confidence interval, four types of questions, which are "if", "why", "how" and "what" questions, have remarkably changed during concrete experience and active experimentation stages.

The performance evaluation results have shown that, the questions used in classes from 4 provinces during concrete experience and active experimentation stages have largely changed. The quantity of creative and critical questions significantly increased: "why" questions increased by 1.47 times, "how" questions increased by 1.31 times, and "if" questions increased by 2.13 times.

(3) Instructional model has significantly changed.

This research used Rt-Ch model to describe instructional model (Wang & Liu, 2008). Rt and Ch refer to rate of teacher activity and rate of switching between teacher activity and student activity respectively. The author used coding system analysis method to analyze 204 sampled class videos, and obtained instructional model data during gaining concrete experience, reflective observation, and active experimentation stages. After using Mann-Whitney U method to test the difference between 2 independent samples, it can be concluded that, with 95% confidence interval, the value of Rt has remarkably changed during concrete experience and active experimentation stages, but neither does the value of Ch.

The performance evaluation results have shown that, the value of Rt in classes from 4 provinces during concrete experience and active experimentation stages has significantly dropped. The instructional model have gradually transformed from teachers' duck-feeding to student-centered one with various activities, and teachers have valued and tried to give back "class" to students. The result that the value of Ch hasn't remarkably changed during concrete experience and active experimentation stages shows that teachers need more professional development on the design, application, monitor and evaluation of teacher-student interactions. It can be concluded that teachers have tried to use their practical knowledge, such as reflective and strategic knowledge to monitor, adjust and improve their instructional activities.

(4) Students think that participating teachers' instructional activities have remarkably changed

We sampled 1000 students coming from different classes in 4 provinces' participating schools to take the questionnaire. We collected 931 valid questionnaires on students' evaluation of participating teachers' instructional activities. The result shows that 85% students think that their teachers' activities have been improved after 4 moths' HSBT. Among them, 51% students think that their teachers have largely improved their instruction, especially on guiding class discussion, clarifying discussion topic, and enlightening students' thinking. On the other hand, 15% students think that their teachers haven't improved their instruction, especially on group evaluation, division, and organization, which need more work on their improvement.

5 Conclusion

Firstly, HSBT has shifted training's paradigm from technology principle to practical learning for professional development.

HSBT views instruction as a complex activity, which thinks that teacher training not only should instruct professional knowledge from external, but also need teachers to deepen their understanding of instruction and then improve their instructional skills through their reflection on practical instructional experience. By providing formal offline learning and informal online learning, HSBT focuses on teachers' professional learning, peer coaching, and reflective communication, shares teachers' forms to improve instruction, values, tools and responsibilities, provides societal, formal, continuing, and resource-intensive learning support service for teachers' professional development. This kind of training shifts its focus from the presentation of training resources to learners' professional development, shifts from instilling preset instructional content to helping learners' deeper understanding and practice, shifts from expert guiding to expert-teacher's cooperation, shifts from unrelated to teachers' practical context to facing the problems teachers have in daily practices.

Secondly, HSBT has well supported teachers' professional development.

During 4-month project, each school-based training group as a unit, we monitored 21 kinds of class instructional activities in 204 classes, which include 4 kinds of typical math class: concept class, review class, skill class, and activity class. We found that the rate of teachers' improved instructional activity is 42.2%, training groups' practical knowledge increased by 30.5%, personal practical knowledge increased by 56.3%; class instructional model has also largely changed: rate of teacher activity Rt decreased by 11.54%, and the rate of switching between teacher activity and student activity Ch increased by 2.8%.

Thirdly, HSBT needs more professional learning assistants are needed to provide services for learners' professional development

In the process of applying HSBT, we invested 54 professional learning assistants according to the ratio of 1/20 to provide services for 1100 teachers, and the services include academic support, cognitive support and relationship support. Learning assistants' effective work plays a vital role in the success of HSBT. Also, the cost of learning assistants increases the cost of HSBT. Future research can focus on how to coordinate the relationship between HSBT's quality and cost.

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Alternative Assessment: Developing e-Portfolio for Final Year Project

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Abstract. Final year project or dissertation is one of the core requirements of the curriculum offered at higher education institutions, with an aim of assessing the qualification for an academic level by providing students with an opportunity to apply what have been studying in a practical, effective, efficient and beneficial manner. Aligned with the intended learning outcomes, teaching and learning activities and assessment tasks are inseparable in the teaching and learning process. Meanwhile, portfolio assessment is a new alternative assessment method when compared with traditional written assessment which collects students' work in the learning process to demonstrate one's effort, progress and achievement in one or more areas. The purpose of this paper is to study the strategy of adopting e-portfolio as a formative assessment method for final year project and evaluate the effectiveness of e-portfolio assessment, where the strengths and restrictions will be analysed. The result illustrated that the implementation of e-portfolio assessment for final year project helps instructors to review the teaching and learning process effectively while giving students timely feedback for improvement.

Keywords: Final year project, dissertation, alternative assessment, e-portfolio.

1 Introduction

Portfolio assessment is a new alternative assessment method [1] when compared with traditional written assessment which collects students' work in the learning process to demonstrate one's effort, progress and achievement in one or more areas [2-4]. Students are involved in the process of data collection, portfolio development and identification of assessment criteria, which engages students in self-reflection and provides an overview of what students have learnt [5].

Electronic portfolio (e-portfolio) is an extension of portfolio assessment with the application of information technology and multimedia tools. To implement e-portfolio, a collection of students' work is digitalised and stored as a record of their learning process [6]. This helps students to manage their portfolio, perform self-assessment on their performance and fine-tune their learning strategies. At the

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same time, instructors are allowed to review and retrieve students' learning process easily, without using up storage space [7-12].

This paper will start with a discussion on the strategy of adopting e-portfolio as a formative assessment method for final year project and evaluate the effectiveness of e-portfolio assessment. The strategy is specially designed for a group of students of engineering studies. A total of 150 students are organised into 40 groups with 3-4 students in a group. Section 2 will discuss assessment practices for final year project. Section 3 will state the proposed strategy for implementing e-portfolio for final year project. Section 4 will evaluate e-portfolio assessment with an analysis of strengths and restrictions of e-portfolio for assessing final year project. Section 5 will give some concluding remarks.

2 Assessment Practices for Final Year Project

2.1 Current Assessment Method

Final year project or dissertation is one of the core requirements of the curriculum offered at higher education institutions. It is an essential part of engineering studies, where students are offered an opportunity to practise engineering methodologies and apply knowledge with judgement, along with the ability to assess what they are doing and to be critical of it. Every year, students are given a list of proposed projects, from which they have to decide on the project title after acquiring advice from the instructor of the topic. Throughout the project period, students and instructor meet regularly where instructor offers guidance to help students to complete their project. Finally, the project is assessed based on a written report and an oral presentation at the end of the semester.

Despite the current assessment method is widely adopted at higher education institutions, some of the major drawbacks include:

- *Summative Assessment without Sufficient Feedback.* Final year project is assessed based on a written report and an oral presentation at the end of the semester. This summative assessment performed at the end of the teaching and learning process mostly emphasises on marking and grading, with a focus on project outcomes. However, the learning process throughout the project period is overlooked. Instructor may not be able to notice the learning difficulties and provide timely feedback to students during the project implementation.
- *Ineffective Alignment with Intended Learning Outcomes.* Final year project and its assessment tasks are inseparable in the teaching and learning process, which are aligned to the objectives and outcomes of the studies. For instance, final year project of engineering studies aims at training students' problem-solving skills for applying engineering technology, developing their professional skills, and exploring potential opportunities of the industry. However, the assessment conducted at the end of the project is not necessarily effective in aligning the learning process with the intended learning outcomes.

- *Absence of Peer and Self-Assessment.* Final year project is mostly assessed by the instructor and a second marker according to a set of pre-defined criteria. The lack of opportunities for students to assess each other and themselves discourages them to take greater responsibility for their learning. During the project implementation, each group of student(s) works on their own project without interacting with and learning from other students. Meanwhile, peer and self-assessment can foster deeper engagement with and enhance motivation for students' learning. These assessments help students to develop organisational skills, presentation skills, self-discipline and self-evaluation [13].

2.2 Proposed Assessment Method – e-Portfolio

To establish a comprehensive approach to assessment for final year project, this paper proposes improving traditional assessment methods with the adoption of e-portfolio assessment strategy. The use of e-portfolio allows students to reflect upon their learning and focus on the learning process. It can be a means to engage students with their learning, enhance their critical skills, and promote active learning. Instructor provides detailed feedback on students' work throughout the project implementation. In brief, the benefits of e-portfolio assessment include:

- *Diversity Assessment.* The contents, assessment criteria and standards of e-portfolio are usually discussed among instructor and students. Once the contents and assessment criteria are determined, a wide range of students' work is collected for evaluating their performance and giving them feedback. This reduces the shortcomings of summative assessment which may not be able to reflect students' ability in an all-round manner [14]. It also helps students to develop self-learning and lifelong learning capability, and allows instructor to adapt to individual difference of students.
- *Enforce Two-Way Communication.* Through e-portfolio, instructor can monitor students' learning progress and give timely feedback [3]. Portfolio assessment is a process of collecting students' showcase and work with purpose such that instructor could understand and review students' effort and achievement in the learning process through analysing the collected data [15]. It is a continuous, diversified and practical basis for assessment strategies in a cooperative manner.
- *e-Element.* Creating e-portfolio is an application of information technology with various multimedia tools, where students' works are kept in digital format [6]. This facilitates instructor and students to review, evaluate and share without temporal and geographical constraints. Students are also motivated to acquire computer skills and design techniques in order to create their own e-portfolio.
- *Demonstration of the Achievement.* e-Portfolio allows students to record their learning process and develop their resume systematically, which helps students to demonstrate their effort, progress, achievement and self-learning capability [3].

Students can upload any of their good works such as a video clipping of a wonderful speech they gave, or a project work that demonstrated their ability and strengths. It can also be a piece of innovative design that they are proud to share with their peers, instructor, mentors or even future employers. It provides a strong evidence to reflect students' ability effectively and is useful for students in pursuing further studies or future career.

3 Implementation of e-Portfolio for Final Year Project

3.1 Establishment of e-Portfolio System

Final year project or dissertation aims at assessing the qualification for an academic level by providing students with an opportunity to apply what have been studying in a practical, effective, efficient and beneficial manner. For students of engineering studies, they are required to perform literature review, system design, implementation, integration, evaluation, and documentation for their final year project. e-Portfolio is adopted as a formative assessment method to assess the learning process of students. Figure 1 shows the interface of the e-portfolio system.

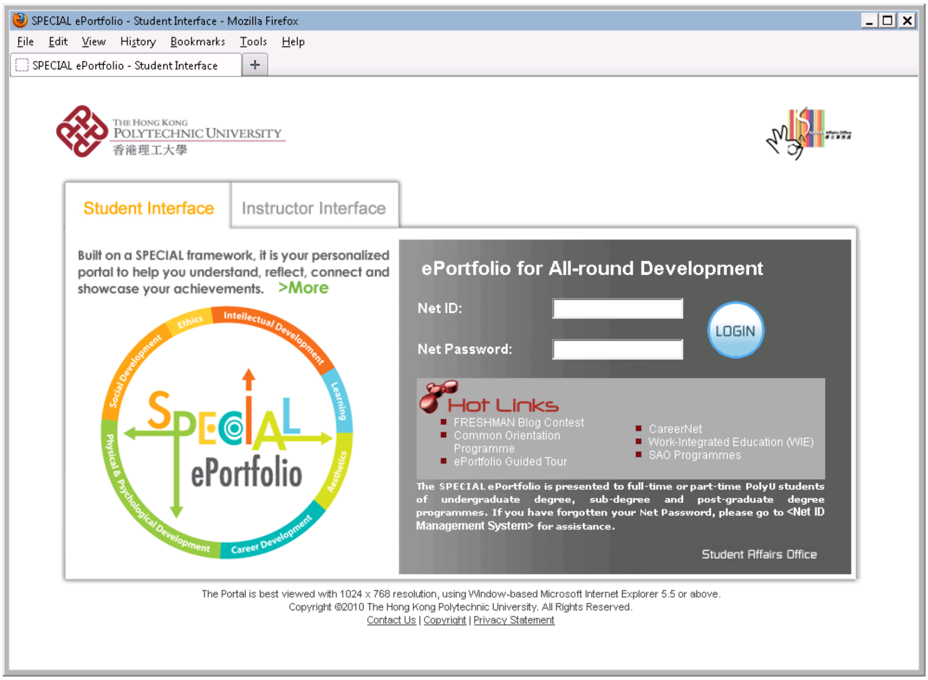

Fig. 1. Interface of the e-Portfolio System

During the project implementation, different kinds of work and data are collected and stored in the e-portfolio for demonstrating students' progress and achievement. Guidance, procedures and assessment criteria are given in advance so that students could align their project with the intended learning outcomes. At the same time, instructor could monitor and evaluate students' work closely and give timely feedback for continuous improvement.

3.2 Implementation of e-Portfolio Assessment

The procedures of developing e-portfolio assessment are: 1) prepare, design and determine the type of portfolio, 2) set the objectives and standards of portfolio, 3) develop the rubric and discuss the assessment criteria. With the e-portfolio system, instructors could set up marking criteria of final year project and monitor progress of the project, in order to give timely feedback and align the project with learning outcomes. The steps for adopting e-portfolio for final year project based on an example of engineering studies are shown below.

Setup of Assessment Criteria through Discussion. With a clear set of assessment criteria, students are able to evaluate their portfolio objectively. Their evaluation includes choosing contents for portfolio, setting standards, and peer and self-evaluation. Therefore, it is important and necessary for instructor and students to discuss and set up the assessment criteria together. The following conditions could be applied in setting assessment criteria, while the actual criteria would be adjusted based on the topic of final year project.

- The contents are representative.
- The contents show the unique characteristics.
- The result and performance are aligned with intended learning outcomes, including but not limited to:
  - improve computer and problem-solving skills;
  - develop critical thinking and the ability to design and evaluate solutions systematically;
  - acquire experience of system development and system integration;
  - recognise professional development and potential opportunities of the industry.
- Communication and cooperation are well demonstrated throughout the learning process.
- Ability of retrieving and using different kinds of resources is shown, e.g., IT resources, library, network, book, etc.

Figure 2 shows the rubric of e-portfolio assessment for final year project.

Criteria	Unsatisfactory – 0%	Limited – 60%	Proficient – 80%	Exemplary – 100%
Selection of Artifacts [40%]	The artifacts and work samples do not relate to the purpose of e-portfolio.	Some artifacts and work samples are related to the purpose of e-portfolio.	Most artifacts and work samples are related to the purpose of e-portfolio.	All artifacts and work samples are clearly and directly related to the purpose of e-portfolio. A wide variety of artifacts is included.
	The artifacts are not related to learning outcomes.	Some artifacts are related to learning outcomes.	Most artifacts are related to learning outcomes.	All artifacts are related to learning outcomes.
Reflection/ Critique [30%]	The reflections do not describe growth or include goals for continuing study.	Some reflections describe growth and include goals for continuing study.	Most reflections describe growth and include goals for continuing study.	All reflections clearly describe growth, achievement, accomplishments, and include goals for continuing study (short and long-term).
Use of Multimedia Elements [10%]	The graphic or multimedia elements do not contribute to understanding of concepts, ideas and relationships. The inappropriate use of multimedia distracts the contents.	Some graphic and multimedia elements contribute to understanding of concepts, ideas and relationships.	Most graphic and multimedia elements contribute to understanding of concepts, ideas and relationships, and enhance the written materials and create interest.	All graphics, photographs, concept maps, spreadsheets, audio and/ or video files effectively enhance understanding of concepts, ideas and relationships, and create interests, and are appropriate for the chosen purposes.
Use of different resources and citations [5%]	No resources are used.	Some resources are used.	Various resources are used.	Vast amount of resources are used.
	No images, media or texts created by others are cited accurately and formatted properly.	Some images, media and texts created by others are cited accurately and formatted properly.	Most images, media and texts created by others are cited accurately and formatted properly.	All images, media and texts follow copyright guidelines with accurate citations. All contents of the e-portfolio comply with copyright permissions.
Navigation [5%]	The navigation links are confusing, and it is difficult to locate artifacts and navigate to related pages or different sections. There are significant problems with the connection to preceding pages or the Table of Contents.	The navigation links are somewhat confusing, and it is not easy to locate artifacts and navigate to related pages or different sections. Some pages do not connect to preceding pages or the Table of Contents.	The navigation links generally function well, but it is not always easy to locate artifacts and navigate to related pages or different sections. Most pages connect to the Table of Contents, with external links connect to the appropriate website or file.	The navigation links are intuitive. Various parts of the portfolio are labeled and clearly organised which allow reader to easily locate artifacts and navigate to related pages or different sections. All pages connect to the Table of Contents, with all external links connect to the appropriate website or file.
Layout and Readability [5%]	The e-portfolio is difficult to read due to inappropriate or inconsistent use of fonts for headings, sub-headings and contents. Many formatting tools are under or over-utilised which decrease accessibility to the contents.	The e-portfolio is not easy to read due to inappropriate or inconsistent use of fonts for headings, sub-headings and contents. Some formatting tools are under or over-utilised which decrease accessibility to the contents.	The e-portfolio is generally easy to read.	The e-portfolio is very easy to read.
Quality of Writing and Proofreading [5%]	There are numerous grammatical, spelling or punctuation errors. The style of writing hinders effective communication and heavy editing is required.	There are some grammatical, spelling or punctuation errors. The style of writing does not facilitate effective communication and some editing is required.	The writing is mainly free of grammatical, spelling or punctuation errors. The style of writing generally facilitates effective communication and minor editing is required.	The writing is free of grammatical, spelling or punctuation errors. The style of writing facilitates effective communication and no editing is required.

Fig. 2. Rubric of e-Portfolio Assessment for Final Year Project

Data Collection. In the course of e-portfolio development, students are required to select appropriate work for collection. With the instructor's guidance, students are able to collect related work and data purposefully and systematically. During the data collection stage, instructor should provide opportunities for students to evaluate their work. Through self-evaluation, students can understand the learning objectives and their pace to a greater extent. For instance, students of engineering studies may include the following items as contents in their e-portfolio to demonstrate their effort, progress and achievement.

- Literature review: include literature to show that they have conducted study and grasped information of their related topic.
- Current application or technology of the industry: include current application or technology to show that they know the latest development of the industry.
- Design of the project at different stages: include different stages of the project to keep track of the progress and demonstrate their organisational and problem-solving ability.
- Production processes and samples: include outcomes of the project to demonstrate their achievement.
- Testing procedures and results: include testing results to demonstrate their critical thinking and self-evaluation ability.
- Evaluation of the completed system: include feedback to provide opportunity for them to perform peer and self-evaluation against the rubric.
- Assessment records: include the assessment records at different stages of the project to keep track of the progress.

Development of e-Portfolio Assessment System. e-Portfolio is one of the trends in higher education, which incorporates multimedia elements including text, audio, image and video into students' learning profile. With the e-element, the portfolio possesses a user-friendly interface and occupies less storage space, and can be circulated with ease [16]. In recent years, many institutions have adopted online learning or e-learning to complement traditional face-to-face classroom teaching. Higher education institutions can now make use of their online learning platform to implement e-portfolio assessment system and apply the existing functions, such as login, discussion forums, bulletin boards, etc., directly. Without the need to design and develop a new e-portfolio assessment system, the proposed strategy can be implemented easily.

Peer and Self-assessment. Peer and self-assessment are introduced to final year project through e-portfolio. While creating e-portfolio, students are required to present and explain their work, where self-reflection and self-assessment are conducted. Peer and self-assessment would help students to have a better understanding on the related topics [17]. Students may exchange their ideas and comments during assessment, which help them to improve their performance in the project. Meanwhile, students' high order thinking skills would be improved, which include critical thinking, planning, and monitoring capabilities [18]. Through peer and self-assessment, students evaluate their work according to the marking rubric which helps them to monitor and assess their progress, recognise strengths and weaknesses of their work, and enhance their skills development [19]. The following criteria are suggested to be included in peer and self-assessment:

- Achievement against learning outcomes
- Mastery of the subject
- Sustainable development of the project in reality
- Contribution to society

Students can make use of discussion forum and bulletin board of the online learning platform for peer and self-assessment, thus allowing all final year students to participate in the open discussion.

4 Evaluation of e-Portfolio Assessment for Final Year Project

4.1 Semi-structured Interviews with Instructors

In this study, semi-structured interviews were conducted with three instructors who supervised final year projects of engineering studies at the associate degree level. A set of questions were formulated to obtain instructors' feedback on assessment practices for final year project and how these assessments affect the teaching and learning experience of engineering studies.

The questions were classified into three categories, which included general questions, strengths and restrictions of e-portfolio assessment. For general questions, we aimed at understanding instructors' general impression on e-portfolio assessment, the reasons for assessment and their practices for assessment. After that, some questions were prepared for collecting instructors' experience of strengths and restrictions of e-portfolio assessment. Transcripts of the three interviews were consolidated and coded, which is shown in Table 1.

Through analysing the interview transcripts and gathering research findings from similar studies, strengths and restrictions of e-portfolio assessment are summarised in the following sections.

Table 1. Coded Transcripts of the Semi-Structured Interviews

Category	Transcripts	Coding
General	"e-Portfolio helps students to review and apply what they have learnt." (Ho) "Students may forget what they have learnt or done shortly." (Ho)	e-Portfolio helps students to revise their study.
	"The assessment criteria categorises students' performance into different levels which helps us to know what they have learnt." (Eric)	e-Portfolio helps instructors to know more about their students.
	"e-Portfolio is a good idea to keep track of the project progress." (Ho) "Continuous assessment informs students what they have learnt or done at different stages." (Ng)	Formative assessment allows students to review their learning progress.
Strengths	"Students can improve their project after obtaining feedback from other students." (Ng) "More feedback would be received through the e-platform." (Eric)	Peer assessment helps students to improve and better understand the assessment criteria.
	"Some students merely focus on the assessment result instead of their learning process. They urge to get high marks but do not learn from mistakes." (Ng) "Students focus on the marks but do not pay attention to the feedback." (Ho)	Some assessments may not engage students in continuous improvement.
	"With the advance of technology, students present their work in a better way." (Ho) "Students acquire computer skills through project implementation." (Eric)	e-Portfolio helps to enhance students' computer literacy.
	"With e-portfolio, we can assess students' work at office and at home." (Ng)	Assessment can be performed anytime, anywhere.
Restrictions	"Students may not understand the assessment criteria." (Ng) "Self-assessment is good for students but not easy to implement." (Eric)	Clear and specific assessment criteria are not easy to set.
	"Sometimes we may not have enough support on the use of e-learning technology." (Ho)	Support on e-learning or e-portfolio is to be strengthened.

4.2 Strengths of e-Portfolio Assessment

Promote Learning. During the implementation of e-portfolio for final year project, instructor plays a consultant role in helping students to learn and grow up [20]. Students who possess strong computer skills can collaborate with and help other students [21]. Therefore, e-portfolio assessment is not merely an assessment method, but a means to promote learning and encourage collaborative learning.

Enhance Computer Literacy. To create e-portfolio, students are required to make use of multimedia and web-based technology. This process facilitates students to learn and apply computer-related technology [22]. In other words, students' computer literacy is enhanced through e-portfolio, hence improving their competitiveness in the workplace.

No Restriction on Time and Location. Instructors are able to assess and offer guidance to students anytime, anywhere.

4.3 Restrictions of e-Portfolio Assessment

Reliability. To assure the reliability of e-portfolio assessment, students have to understand the assessment criteria in the first place, such that they can evaluate their work effectively. While some of the assessment criteria are quite abstract and students may not be able to grasp the exact requirement or expectation, it is not always easy to set clear and specific assessment criteria to assess students' performance. As a result, it is difficult to establish the reliability of e-portfolio assessment. Therefore, e-portfolio should not be used as the sole assessment tool, but to be supplemented by other assessment methods [23].

Effectiveness. The adoption of e-portfolio as a formative assessment method implies instructor has to evaluate students' work on a regular basis, which would greatly increase the workload of instructor. Meanwhile, the lack of support and training on the use of e-portfolio technology is probably an obstacle [24-25]. Therefore, the effectiveness of implementing e-portfolio assessment in all subjects would be uncertain.

5 Conclusion

Formative and summative assessments are not mutually exclusive, but complementary to each other. Assessment entails a collection of procedures that inform the learning process. By developing a range of assessment strategies and using formative assessment in conjunction with summative assessment, there is a great potential to improve learning outcomes for all students. In this paper, adopting e-portfolio for final year project as formative assessment can supplement the inadequacy of summative assessment. Instructor could monitor and assess students' learning process closely to enhance the teaching and learning process. It is also noted that appropriate assessments empower students to reflect on their learning and assess their own progress, and in the long run, lead to the pursuit of self-transcendence.

To further investigate the effectiveness of e-portfolio assessment method, quantitative data can be obtained for the purpose of analysis and fine-tuning assessment practices for final year project. The research can be expanded by collecting students' views on how assessment practices for final year project affect their learning, and how e-portfolio assessment method facilitates their learning and provides opportunities for peer and self-assessment. It is expected that adopting e-portfolio assessment for final year project can enrich students' learning experience. Meanwhile, further study on optimisation and improvement of the e-portfolio system can be performed.

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Structure and Practice of "Four in One" Hybrid-Practice Teaching Mode

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Abstract. Yunnan Radio and TV University tried to "explore the Open University building model" that was approved by the State Council in October 2010. Having tried for more than two years, the university explores building the "Four in One" hybrid-practice teaching model which is an integration of network virtual training, entities training inside school, outside expand training, and learning package individual training. It aims to break through the bottleneck of open and distance education. The model has been applied gradually in practice teaching, and it shows positive initial results.

Keywords: open and distance education, hybrid-practice teaching mode.

1 Introduction

In October 2010, the State Council approved that Yunnan, Beijing, Shanghai, Jiangsu, Guangdong and China Central Radio and TV Universities would build the Open University first and explore its construction model with Chinese characteristics. Yunnan Radio and TV University took the responsibility of exploring the construction model of Open University. In December 2012, as approved by the Ministry of Education, the university officially changed its name to Yunnan Open University.

As a new type of higher education, Open University launches adult distance and open education based on modern information technology. The goal of Open University's is to provide training to grassroots and cultivate those with innovation and good comprehensive ability to become applied talents. This goal makes practice teaching important to the training model of Open University. After exploring the construction of practice teaching system, the "Four in One" model was proposed. The model is an integration of the following four elements.

- **Network virtual training** aims at building network-based virtual practice teaching. The main courses are delivered based on information technology in an open and distance education environment.
- **Entities training inside school** are conducted in the laboratories, training rooms and training bases in the university. Training teaching of some courses and the centralized practice teaching are conducted through entities training.

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- **Expand training** is the practice training in the form of practicum or internship outside school. Students can select the local practice training based location, time and their learning needs.
- **Learning package individual training** is a learning package which includes learning CDs, teaching videos, simulation training, etc. The learners can study independently, and simulate operation and practice using the learning package.

2 Construction Thoughts

Yunnan Open University utilized its 30 years' management experience to build practice teaching model with "reasonable structure, standard operation, convenient and scientific" based on the principles of "using network, based on school, relying on alliances and developing sustainability".

2.1 Integration between Modern Information Technology and Teaching

The practice teaching model of Open University utilizes a variety of media and means to optimize the learning and teaching.

Information technology, especially multimedia and network technology, makes many impossible things become possible. It also solves many problems in practice teaching model. For example, it is impossible to conduct some experimental training due to certain limitations. Simulation experiment may solve the problem and improve the experimental training effect.

The Ministry of Education proposed that "researching and developing the school digitization and virtual experimental system and creating experimental environments which can be shared online". As a result, the Open University has an urgent need to speed up this process. Network virtual laboratory is a new application of virtual reality technology in teaching, so Yunnan Open University actively engages in the construction of the network virtual laboratory. The network virtual laboratory is a powerful supplement to entities training based on the existing network learning platform. It also solves the problems of practice teaching in open education effectively. Through the network, students can conduct the network virtual experiment at anytime and anywhere.

2.2 Powerful Practice Training Base

Yunnan Open University has more than 30 years' experience in managing the radio and TV university. It has established campuses and academic sites over Yunnan with assistance from China Central Radio and TV University. The university is developed based on a system with interaction of three networks, including, sky-network, land-network, and people-network. The system has advantages of the distance education platforms for teaching, network learning resources, and teaching support.

Yunnan Open University has constructed its infrastructure. We further strengthen the network platforms, learning resources and teaching support. We aim at building a learning environment which allows learners to learn at anytime and anywhere.

On the other hand, the university has a powerful system of school training basis. At present, the university has 101 training rooms, 5 practice factories, 14 school training bases, 4227 instruments. The total value of instrument and equipment is around RMB 150 million. Yunnan Open University will actively carry out its practice teaching based on its school training bases.

2.3 Support of Yunnan Open University Big Four alliances

Open University's management is characterized with effective integration and utilization of educational resources of the whole society. In recent years, there is an increasing emphasis on further reinforcement of cooperation with industry and enterprise. The university should provide educational services to build learning organization and promote life-long learning of industry and enterprise. There should be more concentrated manifestation of this feature in practice teaching.

Yunnan Open University works together with government, universities, industry and enterprise to integrate resources and improve the system. They build the Open University Big Four alliances which is the major support to promote the construction of practice teaching system. Yunnan Open University Big Four alliances consist of the following four parts:

- the first is university-support alliance which cooperates with UK Open University and 24 local universities;
- the second is industry-support alliance which cooperates with 14 industry associations including China Tourism Association and introduces the industry credentials by using their resources;
- the third is enterprise-support alliance which cooperates with China Unicom and other 50 large enterprises. For example, Southwest Instrument Company, as one of the enterprise-support alliance, has donated numerical control process center equipment which worth over 100 million;
- the fourth is local-support alliance which cooperates with the municipal governments and education authorities of Yunnan Province to promote the community education by using their resources.

Yunnan Open University will make full use of the advantages of Big Four alliances to provide service for teaching.

3 Construction Measures

Open University's practice teaching mainly involves adult students who have practice experience, so the students' work practice can't replace the practice teaching. However, the students' practice experience will be taken into account of practice teaching.

We combine the work practice with the practice teaching. At the same time, we study students’ background to enhance the adaptability and effectiveness of the practice teaching.

Yunnan Open University has constructed the hybrid-practice teaching model which integrates network virtual training, inside school training, outside expand training, and learning package individual training.

3.1 Relying on the Advantages of Existing Network Resources in Yunnan Open University, and Making Full Use of the Network Platform to Carry Out Network Virtual Training

Network virtual training constructs network virtual practice teaching with support of information technology. The network virtual training is used mainly for distance and open education. Students complete their individual network virtual training for the course experiments. Yunnan Industrial Talent Online Training College is an online training college which is sponsored by the Yunnan Provincial Industry and Information Technology Commission. Yunnan Industry Talent Online Training College is undertaken by Yunnan Open University. The college has constructed the website which has course supermarket, network virtual training rooms, vocational skills certification and appointment of implementation venues. Students can learn theory courses online, watch the practice tutorial video, carry out network virtual experiment, conduct vocational skills training, arrange training and appoint implementation venues online. Students can complete the course experiment, check information of internship at anytime and anywhere.

3.2 Relying on the Existing Experimental Training Base Inside School of Yunnan Open University to Carry Out the Students’ Entities Training Inside School

Entities training inside school carries out the entities training of course experiment, training, internship and other practice teaching based on the foundation of the existing training rooms and training bases inside school. Relying on the good training bases inside school, Yunnan Open University will make full use of teachers and training conditions. Under the guidance of teachers, we will focus on carrying out course experiment, training, internship and other training work. We aim to effectively improve the students’ ability of engineering practice by students individual appointing training or training together.

3.3 Relying on Yunnan Open University Big Four Alliances to Carry Out Outside Expand Training

Relying on Big Four alliances’ outside training bases, *outside expand training* focuses on internships and graduation design (thesis). The students can select the cooperative schools and enterprises nearby according to their location, time and study interest. Students can arrange their own training flexibly under the guidance of teachers.

Relying on affiliated colleges of Yunnan Open University to carry out students' course experiment and training. Most of affiliated colleges built by Yunnan Open University around Yunnan Province are provincial key secondary vocational institutions. They have the good basic conditions of vocational education training. Yunnan Open University will make full use of their various training resources. Their advantages and strengths complement the network basic training and inside school training. Students are grouped based on the requirements of practice teaching and proximity to carry out their outside course experiment and training at affiliated colleges.

Relying on Yunnan Open University's university-support alliance to carry out students' course experiment, training and graduation design (thesis). Yunnan Open University has signed the *University Support Alliance* agreement with a number of universities in Yunnan Province. They have excellent teachers and good experiment conditions as Yunnan Province's comprehensive universities. Yunnan Open University will make full use of their advantages in resources. Each student make appointment and go to school to consult or carry out course experiment, training, graduation design (thesis) and another work according to practice teaching arrangements.

Relying on Yunnan Open University's industry-support alliance to carry out the students' vocational skills training. Yunnan Open University establishes the *industry-support alliance* which creates a learning environment for working adults. We will take advantages of the various resources of the industry associations and introduce the industry qualifications to provide students' vocational skills training.

Relying on the Yunnan Open University's enterprise-support alliance to carry out students' internship and graduation design (thesis). Yunnan Open University establishes the *enterprise-support alliances* which make full use of the enterprises' advanced production equipment and the resources of technology and experts. In allusion to the dispersive characteristic of Open University's students, it allows students to carries out internship and graduation design (thesis) under the guidance of enterprises' engineering and technical personnel according to location, resources provided by enterprises and students' training requirements.

3.4 Constructing Training Learning Package to Carry Out Individual Training

Because some students are living in remote mountainous areas or economically underdeveloped areas without access to the internet, learning package including learning CDs, teaching videos, simulation training and so on are developed, according to the syllabus of course practice. The students can study independently, and simulate operation and practice through the learning package.

4 Example – The course Principles of Chemical Engineering

4.1 Importance of the Course

The course *Principles of Chemical Engineering* is developed by Chemical Engineering and Technology of Yunnan Open University. It links theory with practice. The course provides a foundation of theories in chemical engineering for further study of chemical engineering process and equipment principles. It links the principles with research methods and operational skills. It is an important course to develop students' ability to analyze and solve the engineering practice problems.

Practice teaching helps students consolidate and reinforce their understanding of classroom teaching content. It provides basic training of research methods and operational skills in chemical unit operations. It also cultivates leaners' ability in computing, practice, scientific attitude and thinking. It gradually improves students' ability of comprehensive analysis of the problems and their problem-solving skills.

4.2 Implementing Measures of Practicality Links

This course focuses on cultivation of students' ability. Therefore, we must ensure that necessary and sufficient theoretical knowledge is covered in the course. This course cultivates the high quality skilled applied talents to provide service in the front line of chemical processing.

Specifically, this course focuses on cultivating professional ability based on the work process. It is project-oriented and task-driven. The teaching process in virtual or real training environment achieves the integration of teaching, learning and doing. On the other hand, it also achieves seamless connection between students and enterprises as the mixed practice teaching mode is an integration of network virtual training, inside school entities training, outside expand training, and learning package individual training.

*Network virtual training***.** The network virtual training for the course *Principles of Chemical Engineering* is based on virtools, which is a three-dimensional virtual reality platform to build real chemical unit operation scene. The platform combines the experiment information management system with three-dimensional dynamic panorama roaming, real-time dynamic interaction, process feedback tracking and other functions. It allows the students to complete the training in virtual environment. The virtual training interface is very user-friendly, i.e., clear, easy to understood, and easy to operate. It can feedback data in real-time and simulate the phenomenon vividly and test the training grade. This fully embodies the openness of independent learning practice teaching. Now, our university has the following seven chemical engineering network virtual training projects:

The Fluid Resistance Experiment. Students can measure the drag force of straight pipe and local resistance. Students can also set various parameters, such as tube diameter, length, drag coefficient and so on in this experiment.

The Flowmeter Calibration and Centrifugal Pump Experiment. It consists of calibrating flow meter, single pump, paralleling, tandem and pipeline characteristic.

The Filtration Experiment. In this experiment, students use constant pressure filtration. The students select randomly or specify parameters to ensure the non-repeatability of the results.

Heat Transfer Experiment. This experiment helps students to understand the relationship between bellows, smooth pipes, plug turbolator tube and air flow with the temperature. Students can also compute the surface coefficient of heat transfer and adjust the parameters.

Distillation Comprehensive Experiment. Students can completely simulate the whole process of distillation separation, which is good for the teaching of chemical engineering experiment. Moreover, the parameters are also adjustable.

Absorption and Desorption Experiment. In this experiment, students determine liquid phase mass transfer coefficient when nitrogen desorbs oxygen in the water in disabsorber and the relationship between it with its liquid spray density. The system temperature parameters which affect the Henry's constant and the percentage of oxygen in saturated water are produced by the random conditions. Students can adjust the parameters of filling and disabsorber.

Drying Experiment. Temperature and humidity change as the weather changes. All are included into the simulating program. In this experiment, we introduce the system error which is stopwatched. It can make students experience the process of experiment more truly.

*Inside school entities training***.** Now our university has 2 chemical unit simulation training rooms which meet the students' requirements of cultivating and testing chemical unit operating skills. In addition, we also have chemical process model room and chemical unit training room. These facilities provide powerful hardware guarantee for completing the chemical engineering practice teaching and also cultivate the students' comprehensive ability of professional position and professionalism.

*Outside expand training***.** Our university carries out the construction of practice bases outside school actively. We have built a number of teaching practice bases which are closely related to Chemical Engineering and Technology. They are long-term stable. Our university has already established good cooperative relationships with Yunnan First Fuel Factory, Anning Chemical Factory, Yunnan Second Fuel Factory, Yuntianhua group, Yunnan Yunwei Company Limited, Yunphos, Kunming Chemical fertilizer Factory and other enterprises. Through the outside training bases above, we can complete internship, production practice and other teaching tasks in chemical engineering practice links and provide strong guarantee for cultivating skilled and applied talents.

Learning package. We have developed a learning package which includes textbooks, learning CDs, teaching videos, teaching courseware, simulation training software and other resources. The package provides chemical engineering practice training to students to satisfy their requirements of autonomous learning offline, practice and simulating operation.

5 Conclusion

"Four in One" hybrid-practice teaching model highlights the advantageous features of open teaching. It focuses on cultivating the students' skills by using the virtual scenes of network virtual training rooms and real scenes of training bases inside and outside school. The model integrates classrooms, virtual training, training bases and real working tasks.

Students can choose freely one or several links in mixed practice teaching, including network basic training, inside school entities training, outside expand training, and learning package individual training. Students carry out the relevant hands-on learning according to their own professional practice experience, network conditions and region conditions to complete practice teaching tasks.

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Developing an Indicator System of ICT in Education: From Conceptual Model to Items Extraction

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Abstract. The indicators of ICT (Information & Communication Technology) in education can be applied to monitor and evaluate the effectiveness of teaching and learning process with ICT, which would help practitioners and researchers understand how ICT works in education. To identify the adaptive indicators is the first critical step to build an indicator system. This paper introduces a way to build an indicator system through developing a theoretical framework and a conceptual model. The data from the evaluation demonstrate this indicator system can be applied in the field of ICT in education.

Keywords: Indicator system, ICT in education, Assessment, Monitoring, Conceptual model.

1 Introduction

ICT in education has become a critical way to promote the sustainable development in education and the transaction in the Information Society in the 21st century, in which the knowledge-based economy is regarded as its main feature. Chinese government published a middle and long term plan for educational innovation and development (2010-2012) in 2010, which claims some important perspectives, such as "ICT can be used for transforming traditional education, which should be considered as the first priority in education" [1]. Ministry of Education (MOE) published a ten-year plan (2011-2020) in 2012, which defines the objectives, main issues, and strategies of ICT in education for the next ten years. The most outstanding viewpoints include that ICT can be considered as a most effective tool used to realize education equity, to improve education quality, and to transform traditional education [2]. To realize those objectives, policy makers and practitioners need to manage and implement ICT in education effectively and efficiently. Therefore, developing the indicators and standards for monitoring and evaluating ICT in education is the first step and the most critical work, which can ensure the effective utilization and better understanding of ICT in education.

An increasing demand of measuring ICT in education based on a standardized index in international communities is not only for researchers and practitioners, but

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also for the purposes of information sharing. In the past five years, numerous international organizations, such as UNESCO, OECD, World Bank, and IDB and a number of countries including US, Korea and Singapore, have conducted researches to develop the indicator systems of ICT in education serving as an international benchmarking tool for policy making and applications [3][4][5]. In China, the local education administrative departments and institutions, e.g. schools, colleges and universities, and vocational schools, have developed various sets of indicators of ICT in education based on their needs. However, the goals and the items of indicators are not clear. To develop an adaptive indicator set still needs further investigation and investment.

This paper introduces the way to build an indicator system with the support of a theoretical framework and a conceptual model. The literature review, related work, and finalized indicator system are also presented, which would contribute to the education transformation in China.

2 literature Review

Numerous international organizations, such as UNESCO, OECD, and EU, proposed various sets of indicators of ICT in education. After the items of those indicators being analyzed, four main domains of indicators can be categorized, i.e. infrastructure, human resources, policy management, and learning and teaching. And the data sources for the first three domains can be collected from schools, while the fourth one can be got from teachers and students. In 2009, UIS published a set of indicators for measuring and monitoring ICT in education. Each indicator in the set has been defined in detail in order to apply them correctly, including the definition, the purposes, data requirements and the calculation method, the method of collection, analysis and interpretation, methodological and definition issues and operational limitations. 8 domains including political commitment, public-private partnership, infrastructure, teaching staff development, usage, participation, skills and output, outcomes and impact, and equity are covered in the set of indicators [3]. In 2008, European Union (EU) conducted a study about ‘indicators of ICT in education”. 27 EU Member States have been involved in it, and 3 candidate countries were from the European Economic Area. The main purpose of this study was to identify a set of indicators to monitor the application and impact of ICT in primary and secondary education and to describe the scenarios of ICT in Education in EU. 8 domains have been classified based on the analysis of policy documents from different countries, i.e. infrastructure, curriculum and content, outcomes, school leadership, connectivity, teacher training, ICT support and horizontal themes [6].

Based on the data analysis from IEA, OECD, PIRLS, PISA, and TIMSS, the domains of ICT in education can be categorized as infrastructure, student application, teacher application, ability and support. The indicators can be defined about ICT practice in both primary and secondary schools [7]. Comparatively, EU Indicators of ICT in education focus on students’ learning opportunities with ICT, and a conceptual framework has been developed towards OTL-ICT. The method used to develop EU indicators is to analyze various national goals of ICT in education from the policy level first, and then move to the analysis of data from international organizations [6]. The effective application of ICT in education has been analyzed according to the transformation happening to individuals, education, and society in Korea. The purposes of ICT in education in Korea are to promote individual development, educational transformation, and social economic growth. Korean indicator framework includes three categories of indicators, i.e. investment of economy and human, physical resources, and application. With respect to the domains of indicators, teachers, students, curriculums, policies, educational information services, and infrastructure have been included in this framework [8]. Based on American Education Action Plan (AEAP) published by Clinton government, the American Educational Technology CEO Forum proposed an indicators system including 4 domains, i.e. connectivity, hardware, digital content and professional development. And based on those 4 domains, CEO Forum proposed a well-known indicator system, i.e. STaR (School Technology and Readiness). Four domains have been defined, that is, network connectivity, teachers' professional development, digital resources, and student achievement and evaluation, which can be applied to evaluating the development of ICT in education in a region and in school [9].

According to the analysis above, the way how to develop the indicator systems by international organizations or counties can be identified. The main data sources of UNESCO indicators are from schools and the effectiveness of ICT in education is demonstrated through students. Therefore, students are the main concern for UNESCO indicators system. Korean indicators of ICT in education are similar to those of UNESCO because they concerned the impacts on individuals (i.e. students and teachers), on education and on society. EU takes the political factors of education into account to different countries, and meanwhile, the international comparability of the evaluation results is their focus too. In addition, American STaR mainly stresses the national policy to develop the indicators of ICT in education.

National Educational Technology Center (NETC) and Chinese Educational Technology Association (CETA) conducted a research project "Survey of construction and application status of ICT in primary and secondary education" in 2005. As one of the research outcomes, an evaluation indicator system of ICT in education has been developed. Five domains, i.e. infrastructure, information resources, information literacy, application, and management have been categorized in this indicator system, which include 26 indicators covering most aspects of ICT in education [10]. Other provinces, such as Guangdong, Zhejiang, Liaoning, etc., developed their own indicators system for evaluating the application of ICT in education. The domains proposed by most provinces are infrastructure, information resources, ICT application, teachers, and information management. With respect to evaluating the ICT in education in undeveloped regions, Chinese government has suggested that it is necessary to develop different levels of indicators to reflect the realities. However, some common problems of ICT in education indicators still exist in the practical fields in China, e.g. the purpose of an indicator system being mainly for the administration, partly for learning and teaching; the insufficient theoretical base and the support of systematic planning of the indicator system; and the subjective items of indicators and their weights [11].

Other countries, such as America, Korea, Singapore, and Malaysia, the indicator systems they developed can be used for international comparison mostly. ICT in education in those countries offers high-quality learning environments which can be used to support effective learning, and facilitate the development of individuals, education and society. The indicators proposed by Chinese government represent the current situation of ICT in education, which mainly focuses on school level, region level, or country level, rather than international level. Therefore, they cannot be used for international comparison. When compared the domains of ICT in education in China to other countries, the common domains in China include the environments, human resources, infrastructure, and application, while teachers' professional development, application and skills are frequently employed by other countries.

Results from literature review demonstrate that the aims for developing an indicator system need to be clarified at the very beginning. Then the systematic planning, e.g. the theoretical base and conceptual framework, should be followed. The third step is the analysis of the relevant work for defining domains, and it is essential to develop a practical indicator system. The items of the indicator system would be extracted finally with the support of the analysis of the related indicator systems.

3 Developing a Conceptual Model and Indicators Extraction

3.1 Related Work

UNESCO proposed a theoretical framework of the ICT in education in Fig. 1, which serves as the base to develop an evaluation system [3].

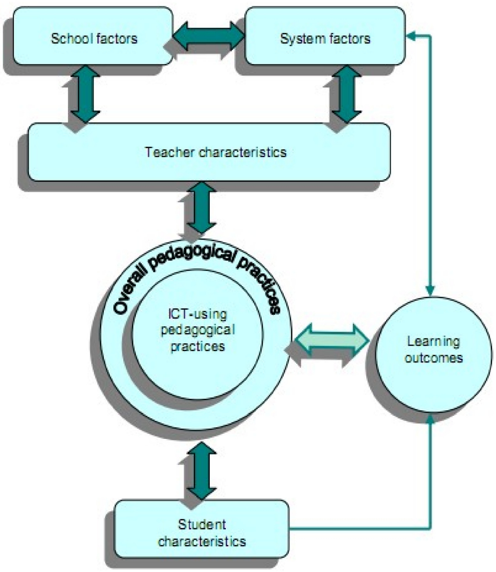

Fig. 1. A theoretical evaluation framework of ICT in education

Fig. 1 presents the overall pedagogical practices with ICT support in schools, where the influential factors include teacher characteristics, student characteristics, and learning outcomes. School factors and system factors are two main components related to teacher characteristics. This framework helps us understand an ICT supported pedagogical practice systematically, which would contribute to identifying the evaluation factors.

According to the overall evaluation results of ICT in education with STaR evaluation tool in different countries or regions, the evolution of ICT in education can be divided into four stages including emerging stage, application stage, infusion stage and transformation stage [9]. Each stage has been introduced in Table 1.

Table 1. The definitions of four stages

Stage	Characteristics
Emerging	having a preliminary understanding of ICT; start ICT infrastructure construction; explore the integration of ICT into curriculum
Application	Infrastructure construction has a certain scale; began to constructing resources and application; carry out further exploration about the integration of ICT into curriculum
Infusion	Infrastructure construction has already completed; Resources construction is perfect day by day; the use of IT become more widely ;
Transformation	IT becoming the necessary part of education; building learning environment by IT

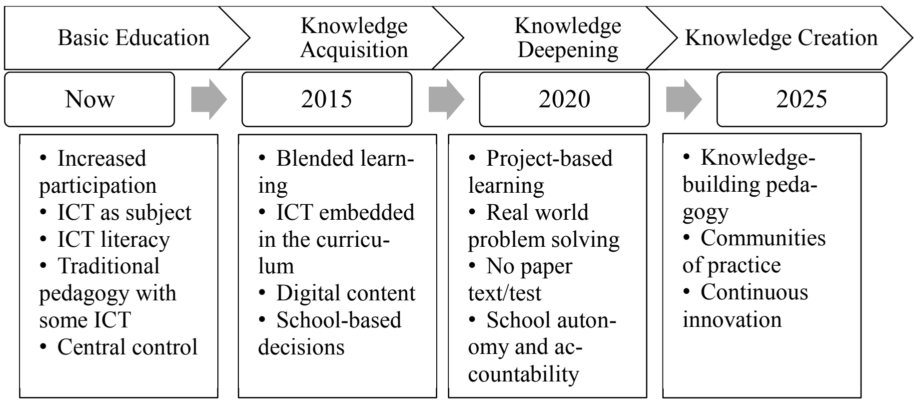

Fig. 2. Education Trajectory in Jordan: 2012-2025 (the Knowledge Ladder)

Kozma proposes a goal planning framework in 2010-2025 for ICT in education in knowledge economic society for Jordan Kingdom in 2010. Four stages, i.e. basic education, knowledge acquisition, knowledge deepening, and knowledge creation, have been defined as the goals of ICT in education. The application of ICT should achieve a certain goal characteristics in each stage. The characteristics of each stage are introduced in Fig. 2.

3.2 The Theoretical Framework

An indicator system of ICT in education should focus on teaching and learning, which can be presented as an "input——process——output" model (See Fig. 3.).

The model showed in Fig. 3 simulated an enabling accessing process, which includes four components, i.e. input, process, output, and context. In the "Input", the indicators should be extracted based on whether they are applied in learning and teaching, which called enabling solutions. Those indicators can be considered as explanatory variables. Thus, the density and variety of ICT in education would influence students and teachers accessing.

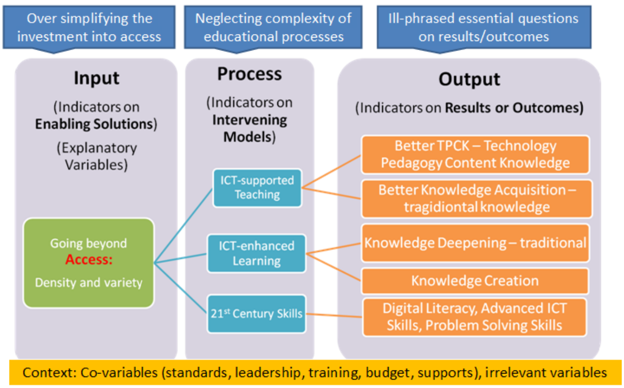

Fig. 3. The enabling model of input-process-output framework for ICT in education

Analyzing "Process" is always complex. The way to reduce complexities of educational processes is to neglect it. The indicators could be extracted based on intervening model. Three categories including ICT-support teaching, ICT-enhanced learning, and 21st century skills have been identified to mainly focus on [12].

"Output" can be considered as results or outcomes, which could be traced back to the access part. Indicators about results or outcomes can be categorized into three groups, i.e. ICT-support teaching includes better TPACK and Better knowledge acquisition, ICT-enhanced learning is composed of knowledge deepening and knowledge creation, and 21st century skill is involved in digital literacy, advanced ICT skills, and problem solving skill. From results or outcomes in "Out", we can see how "Process" worked finally.

Context offers the relevant support to ICT in education where indicators should be extracted from co-variables, i.e. standards, leadership, training, budget, and support, and irrelevant variables.

3.3 The Conceptual Model

Three dimensions, i.e. environment, application, and education transformation, have been defined as a framework to build the conceptual model of ICT in education. The relationship between environment, application, and education transformation can be described as Fig. 4.

Fig. 4 presents the relationship among environment, application, and educational transformation. Three levels, i.e. primary level, medium level, and high level, have been involved in the environment development dimension, which are related to ICT development.

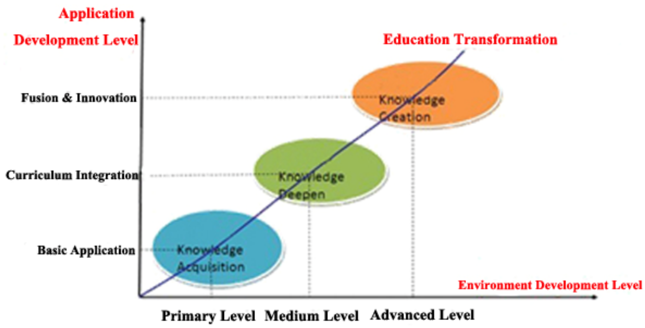

Fig. 4. A three-dimension model of ICT in education for indicators extraction

According to the theoretical model and the conceptual model of ICT in education, two domains, i.e. environment and application, have been defined as a framework to extract indicators. The details of domains and sub-domains are showed in Table 2.

Table 2. The domain and sub-domain of ICT in education

Domain	Sub-domain
Environment	Policy Investment Software & Hardware Digital Resources Human Resources
Application	Teaching Learning Management

Based on enabling solution, domains and sub-domains can be used to support indicators extraction, which means that the usability of indicators of ICT in education should be considered firstly. Working on this way, 33 indicators have been extracted for monitoring and evaluating the application of ICT in education eventually.

4 Evaluation

A questionnaire survey has been conducted to investigate whether the indicators can be applied in schools to monitor and evaluate the application of ICT in education. 8 schools have been involved in this survey for 2 weeks. The data collected from teachers, managers, technicians, and principles from those schools. Based on data analysis, the average degrees of recognition for the indicators in the environment and application dimensions are showed in Fig. 5 and Fig. 6.

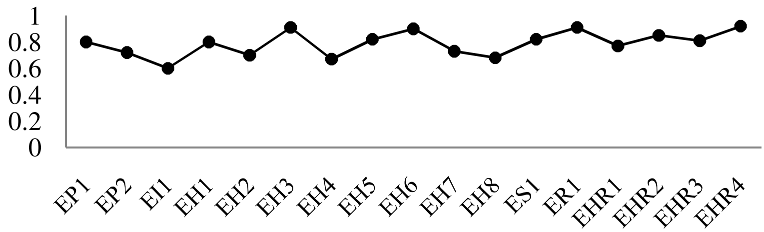

Fig. 5. Average degree of recognition for the indicators in the environment dimension

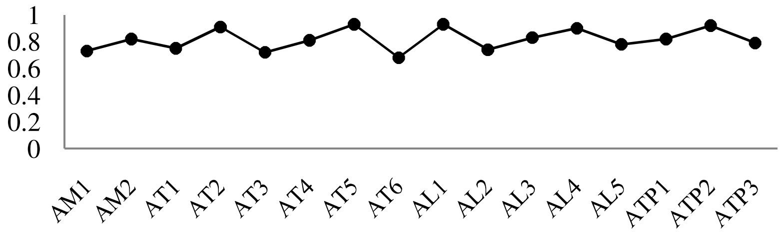

Fig. 6. Average degree of recognition for the indicators in the application dimension

The total average degree of recognition for the indicators in the environment dimension 0.79 and 0.82 in the application dimension, which illustrates that those indicators are well recognized by participants. Therefore, the indicators extracted from this study can be used to monitor and evaluate the application of ICT in education.

5 Conclusions

In this study, a theoretical framework and a conceptual model have been developed to identify the indicators of ICT in education. 2 domains and 8 sub-domains have been defined based on the application of ICT in education. 33 indicators in total are extracted from the field of ICT in education. The results of questionnaire evaluation demonstrate that those indicators well correspond to the schools situations, which represents the application of ICT in education. The following conclusions have been worked out based on this study.

(1) The theoretical framework and the conceptual model are the basis to build an indicators system, which would help us to analyze the real situation of ICT in education.

(2) A good indicators system can be applied to monitor and evaluate the application of ICT in education. Meanwhile, the evaluation results can also be used for comparing the effectiveness of ICT in education in different areas, i.e. national or international levels.

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Appendix I: The Indicators of ICT in Education

Conceptual Domains	Sub-Domains	Indicators
Environment **(E)**	Understanding and vision for policy (E.P)	E.P1 Level of understanding of national policy about ICT in education among school leaders and teachers
		E.P2 Enacting development plan of the School ICT in Education.
	Financial support (E.I)	E.I1 The condition of School-based public funds available to support ICT in education.
	Hardware and networking facilities (E.H)	E.H1 Speed of Internet connection.
		E.H2 Number of locations in school covered by wireless network.
		E.H3 Percentage of classroom equipped with network
		E.H4 Percentage of classroom equipped with multimedia facilities
		E.H5 Number of students per computer
		E.H6 Number of computers per teacher
		E.H7 The development of students' network ethics, safety awareness and skill.
		E.H8 Allow students to bring their own computer to school.
	Software (E.S)	E.S1 Have a network platform used to communicate with parents in school.
	Digital resource (E.R)	E.R1 Have digital resources websites (regional sharing or self-developed).
	Human Resources (E.H)	E.HR1 The Up-To-Standard Rate of teachers' ICT ability
		E.HR2 Percentage of teachers have received training related to ICT
		E.HR3 Number of Technical support staffs
		E.HR4 Training hours on ICT use in education per school leader
Application **(A)**	Management (A.M)	A.M1 The application of educational information management system
		A.M2 The application of Electronic Campus Administrative System.
	Teaching (A.T)	A.T1 Hours of ICT classes per week.
		A.T2 Number of classes used ICT for teaching per teacher every week.
		A.T3 Computer-aid evaluation used by Teachers.
		A.T4 ICT-supported and student-centered learning style developed by teachers
		A.T5 The application of instructional management system used by teachers
		A.T6 Teachers ensure that all the boys and girls use ICT equally
	Learning (A.L)	A.L1 The condition of using ICT for student's learning in school

Conceptual Domains	Sub-Domains	Indicators
Application **(A)**	Learning (A.L)	A.L2 The type of learning activities with computers A.L3 Hours of use of computer per student to learn after class every week (optional) A.L4 Whether to Carry out one-on-one learning A.L5 Whether to have Ubiquitous Learning based on the interschool cooperation
	Teacher's professional development (A.TP)	A.TP1. The condition of online teacher training A.TP2. The condition of researches on the ICT done by teachers A.TP3. The condition of teachers' professional development supported by the ICT.

Appendix II: Questionnaire of the Degree of Agreement to the Indicators of ICT in Education

Please fill in a suitable number depending on your degree of agreement between 0 and 1. If you totally agree, the number can be 1. If the number is 0, it represents that you do not agree at all.

1.	E.P1 Level of understanding of national policy about ICT in education among school leaders and teachers	( )
2.	E.P2 Enacting development plan of the School ICT in Education.	( )
3.	E.I1 The condition of School-based public funds available to support ICT in education.	( )
4.	E.H1 Speed of Internet connection.	( )
5.	E.H2 Number of locations in school covered by wireless network.	( )
6.	E.H3 Percentage of classroom equipped with network	( )
7.	E.H4 Percentage of classroom equipped with multimedia facilities	( )
8.	E.H5 Number of students per computer	( )
9.	E.H6 Number of computers per teacher	( )
10.	E.H7 The development of students' network ethics, safety awareness and skill.	( )
11.	E.H8 Allow students to bring their own computer to school.	( )
12.	E.S1 Have a network platform used to communicate with parents in school.	( )
13.	E.R1 Have digital resources websites (regional sharing or self-developed)	( )
14.	E.HR1 The Up-To-Standard Rate of teachers' ICT ability	( )
15.	E.HR2 Percentage of teachers have received training related to ICT	( )
16.	E.HR3 Number of Technical support staffs	( )
17.	E.HR4 Training hours on ICT use in education per school leader	( )
18.	A.M1 The application of educational information management system	( )

19.	A.M2 The application of Electronic Campus Administrative System.	( )
20.	A.T1 Hours of ICT classes per week.	( )
21.	A.T2 Number of classes used ICT for teaching per teacher every week.	( )
22.	A.T3 Computer-aid evaluation used by Teachers.	( )
23.	A.T4 ICT-supported and student-centered learning style developed by teachers	( )
24.	A.T5 The application of instructional management system used by teachers	( )
25.	A.T6 Teachers ensure that all the boys and girls use ICT equally	( )
26.	A.L1 The condition of using ICT for student's learning in school	( )
27.	A.L2 The type of learning activities with computers	( )
28.	A.L3 Hours of use of computer per student to learn after class every week	( )
29.	(optional)	
	A.L4 Whether to Carry out one-on-one learning	( )
	A.L5 Whether to have Ubiquitous Learning based on the interschool cooperation	( )
30.	A.TP1. The condition of online teacher training	( )
31.	A.TP2. The condition of researches on the ICT done by teachers	( )
32.	A.TP3. The condition of teachers' professional development supported by the ICT.	( )

Data-Driven Learning and Learner Interviews in a Japanese Context

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Abstract. This paper outlines the research conducted for the purpose of examining the efficacy of data-driven learning (DDL) tasks and semi-structured interviews implemented in the Japanese tertiary education. Specifically, the attitudes of students, divided into three proficiency levels, towards the tasks in a hybrid language learning course were analyzed. A brief background of this study is provided, followed by the description of DDL in a Japanese educational setting. Then the aims and the results of the present study are explained. The findings suggest that student perceptions of DDL tasks differs significantly according to several major factors, such as an ability to reflect upon their previous learning experiences and differentiate between the benefits and drawbacks of the task. It can be concluded that interviews are effective tools for the instructor to provide different types of students with different instructions for successful implementation of DDL in hybrid learning environments.

Keywords: Data-Driven Learning, Language Learning, Interviews.

1 Introduction

As hybrid learning approaches have significantly developed in many countries, numerous studies have indicated that computer assisted language learning has had an important role to play at the tertiary level [1-2]. One of the language learning methods utilizing computers provides students with a large collection of authentic language, which is a ‘corpus’, and a tool, which is a ‘concordancer’, in order to examine the language data. This approach, called ‘data-driven learning’ (DDL), as defined by Johns [3] can prove effective for students to examine how language works and discover the lexical patterns associated with a specific word or phrase [4-6]. Various types of corpora, which include naturally occurring language data, either written or spoken, have been used in the development of most recent dictionaries and become effective learning tools in the language classroom [7-8]. DDL presents learners with multiple language examples and learners are encouraged to look for lexical and/or grammatical language patterns. In English tertiary education, especially in Europe and China, DDL tasks utilizing corpora have been introduced into the language classroom. The experiences of DDL tasks have proven to be beneficial to the students in the

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 122–133, 2013.

following three ways. Firstly, DDL allows students to pay close attention to the target word in various contexts and to make valid conclusions about the forms and usages of the target word [9]. Therefore, this approach has been recognized as an effective solution to gain linguistic information beyond that supplied by dictionaries and grammar books [10]. Secondly, DDL activities encourage students' inductive learning which assists their lifelong learning without the help of the instructor [11]. Thirdly, DDL is expected to enhance student autonomy and support individualized learning [12].

Utilizing DDL tasks as supplement classroom instruction or extra follow-up practices has been prevalent among many countries [13]. It is worth noting that, however, in Japan, relatively little in-depth research has been carried out to address the effectiveness of DDL activities. Furthermore, little has been done to examine a connection between the efficacy of DDL tasks and student perceptions and attitudes toward them, even though the fact that the successful implementation of DDL tasks into the classroom depends on student basic ideas and preferences [11]. This could hamper the sustainable development of DDL activities. In addition, unfortunately, focus has often been placed on a variety of applications of activities with different computer programs [14] rather than on the perceptions of different students with different proficiency levels. For the purpose of making this innovative approach fit easily into the organizational structure of higher education administration [15] in Japanese educational settings, more emphasis should be placed on the development of pedagogical approaches that are suitable for Japanese students and their cultural contexts. Study of specific key factors which affect Japanese students' perceptions and attitudes towards DDL studies and the data gathered from that is indispensable. This article seeks to address this issue.

2 The Study

2.1 Purpose

The primary aim of this study is to determine how interviews reveal students' perceptions of DDL tasks in hybrid language learning course. This course was designed to assist students to improve English language by emphasizing the development of lexical skills. The following questions were specifically focused on.

1. What is the impact of DDL tasks in hybrid learning environment on students with different proficiency levels?

2. What do semi-structured interview reveal each student attitudes towards DDL tasks?

How this innovation can activate student prior language experiences will be determined based on the results of semi-structured interviews conducted at the end of the course.

2.2 Students

In this study, participants were Japanese university students (n=34) who studied electronic and information technology in 2011. They were in either the second year or third year of their bachelor's degree at a university. The course the survey was conducted was a compulsory English hybrid course. The students were accustomed to traditional teacher-directed, step-by-step instructions in a large lecture-type classroom. In addition, they were familiar with passive and sequential learning approaches which can often be seen in most engineering education [16]. The student survey carried out during the course indicated that 47.1% of the students had an advanced computer skills. Although many students had extensive computer competency, they had no previous experience of DDL learning. Almost all students were weak in English (91.2%) and, their level of English ranged from beginners to intermediate. 52.9% of the students had an experience of using online English dictionaries in their daily lives. All of the students had learned English for at least six years in secondary school in which vocabulary was a skill that was given much attention. Despite the fact that the majority of students' English proficiency was not high, many students thought English was potentially very important after the graduation.

2.3 Course Design

The course examined in this study was designed in order to encourage students to improve their English lexical skills and promote autonomous learning through the goal-oriented DDL tasks. Despite the fact that the course was comprised of Japanese traditional teacher-centered instructions in combination with online independent studies, these two approaches were closely correlated each other. In addition, each task the students were required to engage in throughout the course, such as "writing a log concerning listening tasks", "compilation of a corpus", and "corpus analysis tasks" was closely connected each other in order for students to become self-directed English learners. In other words, the entire course was a continuous process rather than a discrete event. The class was scheduled for one and a half hours each week over a 15-week course in a computer classroom. The tasks were roughly divided into two stages outlined as follows.

First Stage:
The students listened to online English conversations with various topics named English Listening Lesson Library Online (http://www.elllo.org/) and then wrote a log. In the log, students were required to write the details of the conversations, including a summary, a word list, and a comment of each conversation.

Second Stage:
Firstly, students were required to compile a corpus based on the listening scripts. The students were then required to decide targeted words to search for. They attempted to identify some basic verbs they didn't fully understand the meaning and usages from the previous listening tasks. The students assembled the digital

linguistic data by dragging the web script page into the document and constructed language database. The digital data was only used within the confines of individual students' references.

Lex

This computer program is for retrieving and displaying lexical combinations from any kind of text data. This user-friendly concordance, *Lex*, performs the simple function of searching and extracting all the occurrences of a certain key word or phrase in a language database. *Lex* helps students easily find lexical patterns and combinations which are associated with the key word. *Lex* was installed in an Apache web server with Tomcat on a Linux computer. The students independently consulted various lexical patterns by this computer program. This system has been designed for students without any corpus consultation experience. As in Figure 1, the search results can be displayed in Key Word In Context (KWIC) mode in a plain text document. The letters and the numbers on the left-hand column provide the origin of each concordance line.

```
[2BigRedBus]  times. When I was younger, you used to get double-decker all over England but n
[3Dogs_____] I mean, it's a long process, right...we get them when they're puppies.....and so
[3Dogs_____] s of reunions of the pets so, yeah, you get to see them once in awhile. Oh, wow,
[5Australia] f by the politicians so Sydney wouldn't get too crowded. It's a separate territo
[12FirstJob] ears. I spent half the lesson trying to get them to say,"Hello" to each other an
[13Vacation] in the reservoir. Yeah. OK. How did you get to Las Vegas? By plane from Oakland
[16TheJock_] n TV? Well, now living in Japan I don't get, um, get many chances to watch the N
[16TheJock_] l, now living in Japan I don't get, um, get many chances to watch the NBA but I
[18TheLove_] retty serious and then he was trying to get rid of an ex who kept bothering him
[18TheLove_] did you feel? Like I needed a ladder to get on a piece of paper, really, I mean
[19Train___] as pretty much the most basic you could get. There were no animals on board but
[22BusStory] nd a half years older than I am, and we get along very well now.  You get along
[22BusStory] m, and we get along very well now.  You get along very well now! How did you get
[22BusStory] ou get along very well now! How did you get along in the past? Not very well at
[23Music___] r? Of course I do, yeah! Every chance I get.  Wow, what kind of songs do you sin
```

Fig. 1. An excerpt of the student's data

At the beginning of the DDL tasks, the instructor provided guidance in order for students to understand the basic concepts and techniques for the tasks. Subsequently, sample tasks were presented to the students concerning how to analyze language forms from the data. The focus was on language forms and usages associated with the targeted verbs, and to examine collocations and other lexical combinations. The aim was to increase the students' awareness of the usages of high frequency verbs and their functions in the typical discourse community. This stage was a solely independent learning for students in this course.

2.4 Semi-structured Interviews

Before the course completed, three groups of students with different English proficiency levels, A1-A5, B1-B5, and C1-C4, were invited for a semi-structured interview. Each group consisted of 4-5 students. The instructor selected these students based on the task scores they had received. Interview questions explored such aspects as "writing a log concerning listening tasks", "compilation of a corpus", and "corpus analysis tasks".

The purpose was to gauge their opinions on how they felt about the DDL tasks including the advantages and disadvantages of the tasks. Since the interviewees had difficulty understanding English questions and speaking English, all interviews were conducted in Japanese. The interviews were audio-recorded and transcribed.

2.5 Questionnaire Survey

A questionnaire survey was conducted at the end of the course. This post-course questionnaire survey aimed to collect students' comments and opinions on the tasks they had completed throughout the course. Students were required to assess their computer abilities and other abilities relevant to the learning of English, and to reflect upon how they had thought during the tasks. All questions were written in Japanese. The rating scale used in the questionnaire was a 10-point Likert Scale with 1 representing "strongly disagree" and 10 representing "strongly agree". The responses were totaled and averaged. Standard deviation was then obtained for the purpose of examining statistically significant differences between students' responses.

Table 1. Student views upon the DDL tasks

1. I understood what kinds of lexical items are used with the key words in the concordance lines.
2. I believe *Lex* would allow me to understand what kinds of words and phrases are used with the key words.
3. I was able to organize my findings by focusing on various language features and lexical combinations.
4. I believe I would be able to organize lexical findings by focusing on various language features utilizing corpora.
5. Concordance lines allowed me to identify what type of context was associated with the key words
6. I was able to understand the meaning of concordance lines without reviewing the scripts.
7. I was able to understand various uses of high frequency verbs presented in the scripts.
8. The uses of high frequency verbs presented in the scripts and those presented in online dictionaries differs to each other.
9. Organizing lexical findings utilizing *Lex* continues to be effective in improving my lexical abilities.
10. My organization of lexical findings is more effective than consulting online dictionaries when understanding language uses and features.
11. In order to improve lexical skills, utilizing *Lex* is more effective than a list of English words with corresponding Japanese counterparts word by word.
12. On comparison, findings resulting from *Lex* provide more learning opportunities regarding usages and features than those resultant from online dictionaries.
13. The effective utilization of *Lex* effectively depends on how one can utilize online dictionaries.
14. I firmly intend to utilize *Lex* in my future English study.
15. *Lex* is a user-friendly tool.
16. *Lex* helps me improve my lexical abilities.
17. *Lex* helps me improve my general English abilities.

18. If utilizing *Lex*, online dictionaries are indispensable.
19. The instructor should have given us more in-depth explanation concerning how to organize lexical findings utilizing *Lex*.

3 Findings

The results of the questionnaire revealed the students' different values and attitudes toward DDL tasks and *Lex*. Figure 2 illustrated that many of the advanced students, except for student A5, understood what kinds of lexical items were used with the key words in the concordance lines. As a result, these students were able to organize their findings by focusing on various English features and lexical combinations (Q3). These findings were in accordance with the comments provided by the advanced students in the interviews. One of the advanced students stated the benefits of corpus compilation and consultation as follows:

A1: The corpus compilation helped me learn some new words. I thought that was good. Before I did this task I thought I knew the meanings of basic verbs, but actually this task helped me realize those words have other meanings.

In addition, the results of the questionnaire indicated that, with regard to the comparison between the efficacy of online dictionaries and the lexical findings from the tasks, many students acknowledged that the tasks were better than dictionaries (Q10). These students didn't recognize the importance of dictionaries when using *Lex* (Q18).

It is also interesting to note that many of the students, except for student A4, didn't highly value *Lex* (Q14). However, comments on the tasks suggested that some students had an ambivalent attitude toward the efficiency of *Lex*. While these students understood the potential benefit of this tool, they acknowledged that this tool didn't meet the Japanese students' present language learning needs.

Interviewer: What did you think of the program?

A2: The program would be useful, for example, for people who write reports. They would understand how words co-occur with each other. The problem with *Lex* is, I would say, what the results you get using *Lex* depends on how big the corpus is.

Interviewer: Oh, I think I understand what you mean. You mean if you tried to examine not-so-high frequency words and the corpus is not big enough, you wouldn't get enough concordance lines for your examination.

A2: Yes.

A3: If I was a high school student and examined only high frequency verbs, *Lex* would be useful. But it is also true that what high school students are required to learn to pass National Center Test for University Admissions is quite limited. In order for them to pass the Test, I would recommend reference books. The time and energy you can devote to study high frequency verbs is quite limited.

A2: I agree with him. Within the limited high school class time, the teacher cannot give comprehensive lectures.

In addition, the comments provided by the advanced students in the interview have suggested that many students preferred vocabulary and grammar books over DDL resources. These students' perceptions toward the DDL tasks clearly reflected how they had learned English in the secondary school.

Interviewer: If you had been required to use *Lex* with a textbook corpus in your high school, would you have been happy?

A5: I wouldn't have been happy. I would have used grammar reference books, for example.

A3: I would have wondered why I had to do it.

A5: If I was a high school student now, I would read vocabulary books.

Interviewer: I see.

A2: Ideally, I wish we could read a lot of English material and understand the meaning of the words in it while reading it.

Interviewer: What do you think, A4?

A4: *Lex* is suitable for university students. High school students don't have much time to use *Lex* in an English class. Within the limited time provided by English classes, high school students don't have time to use *Lex* for their English study. I would recommend grammar reference books or vocabulary books instead.

A1: *Lex* is OK for university students. But high school students would not understand what concordance lines mean. Checking the amount of stars as an indication to the level of words in an English dictionary is good enough for them.

These comments suggest that many advanced students preferred time-saving, efficiency-oriented approaches to their language learning over the time-consuming tasks they had completed.

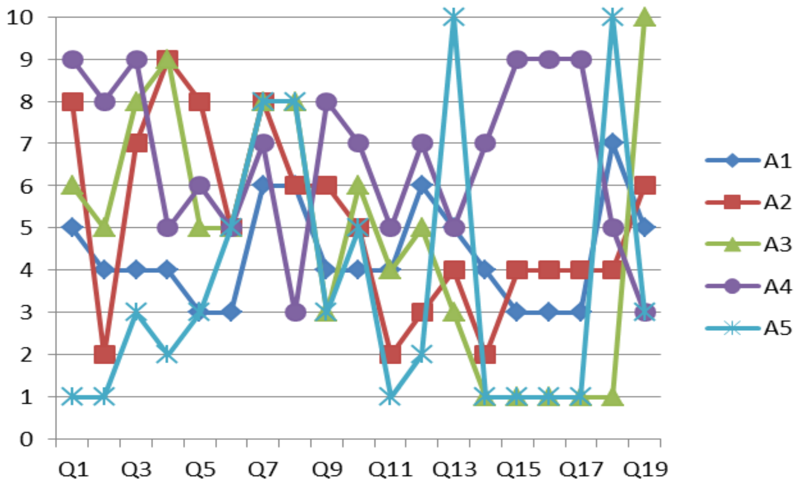

Fig. 2. Questionnaire results: Advanced students

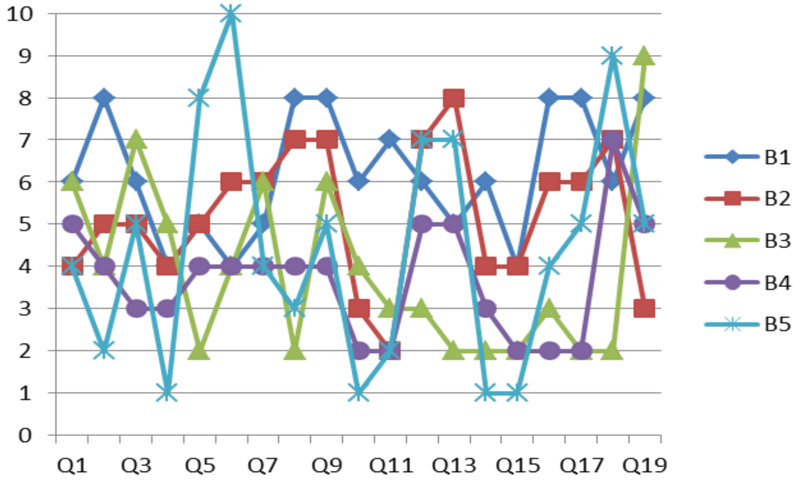

Fig. 3. Questionnaire results: Intermediate students

Compared with the advanced students, the intermediate students displayed different tendencies toward the tasks and *Lex*. As shown in Figure 3, in comparison with the advanced students, fewer intermediate students were able to understand what kinds of lexical items were used with the key words (Q1). Fewer students were able to organize lexical findings by focusing on various language features (Q3). In addition, with regard to the comparison between the efficacy of using online dictionaries and *Lex*, many intermediate students acknowledged that online dictionary look-up proved more useful for completing their tasks (Q10). The intermediate students thought online dictionaries were essential for completing the tasks (Q18).

In addition, in the interview, compared with the advanced students, intermediate students acknowledged the practical value of *Lex* in the classroom, and tended to have a distinctive opinion on the tool.

Interviewer: How about *Lex*? What do you think about *Lex*? B5?

B5: First of all, I was very impressed with *Lex*. I felt like “Wow, this is totally awesome!”

B2: Key words being displayed in the middle of a text were absolutely breathtaking.

Interviewer: I know everybody was impressed, stunned, and excited about the search results by *Lex*. But what do you want to do with the results?

B5: If you didn’t have any basic knowledge of lexical patterns, you would have difficulty knowing what to do with the results.

B2: *Lex* would be very useful when you first read a text or a story and then perform search results by utilizing *Lex*.

B5: Yeah.

B2: Having search results with *Lex* enables you to categorize various meanings of certain key words without looking up the word in your dictionary. When you were required to translate a certain English text and if you had the electronic text file, *Lex* would be even more useful.

One student in both advanced and intermediate groups couldn't understand the value of *Lex* and thought that online dictionaries were indispensable for the DDL tasks (Q18). In addition, these same students thought the instructor's in-depth explanations concerning the tasks were essential (Q19). In the questionnaire, when asked about the future use of *Lex*, negative results were collected in both advanced and intermediate groups (Q14). However, in the interviews, some intermediate students stated the importance of easy accessibility of electronic text files for the successful implementation of DDL tasks using *Lex* in secondary school, as follows.

Interviewer: If you had received electronic text files derived from all your textbooks used in your secondary school, for example, do you think you would have studied English more efficiently or effectively?

B4: That would be great if I had electronic textbook files and if I examined the high frequency words and studied them. Yes, that would have made a big difference.

B2 & B3: That would be amazing.

B2: Those vocabulary books include model English sentences or examples with a targeted word and they intend to increase vocabulary skills. Right after each sentence is the meaning of the targeted word.

Interviewer: Right. I know.

B2: If you put all the sentences in the books together to compile a corpus, I think you could use *Lex* more effectively.

These constructive comments suggested that, even though their accomplishment was unsatisfactory, they understood DDL tasks, if conditions were right, would provide students with massive exposure of grammar and vocabulary. These students have the potential to reflect upon their learning experiences and will be able to differentiate between the benefits and problems of DDL tasks.

As for the lower-level students, Figure 4 shows small variations in their responses. In addition, the results of the questionnaire indicated that, in comparison with the advanced students, fewer students were able to understand what kinds of lexical items were used with the key words (Q1). Fewer students were able to organize lexical findings by focusing on various language features (Q3).

In the interviews, none of them highly valued *Lex* and, therefore, many were unwilling to use this tool in the future.

Interviewer: How many of you are willing to use *Lex* again?

Interviewer: Nobody…

Interviewer: How about you, C2?

C2: I understand how to use *Lex*, but I can't think of any other way to use it.

Interviewer: I see. How about you, C4?

C4: Well …. that program was … well, I can't think of any other way, either.

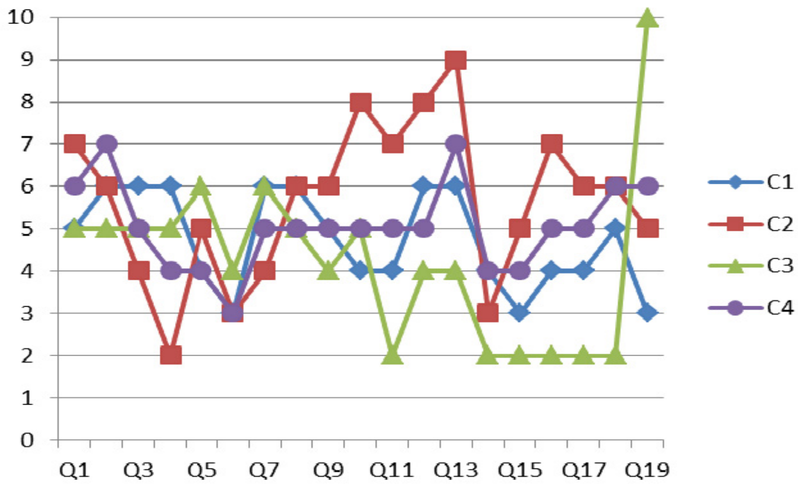

Fig. 4. Questionnaire results: Lower-level students

In regards to what they didn't like about the course, many lower-level students stated that the analysis of the language data was time-consuming and laborious. This finding is in accordance with the results of the students' questionnaire as shown in Figure 3.

4 Discussion and Conclusions

Although the sample size is too small to allow any generalization, the data collected from the questionnaire and the interviews offered valuable information which instructors should take into account when implementing DDL tasks in hybrid learning environments. As the findings outlined above have suggested, only a few students, regardless of proficiency levels, acknowledged the benefits of DDL tasks. Many students didn't think that analytical tasks assisted them to raise their awareness of various meanings and usages of the words and expressions. In addition, the findings have shown that student perception about DDL tasks do not depend thoroughly on how well they can accomplish the tasks. However, the student comments indicated as to why DDL tasks haven't been widely used in Japanese secondary and tertiary institutions. In secondary school, the students were required to read a small amount of English examples and to do small size of exercises in a piecemeal fashion. The Japanese traditional methods of learning vocabulary, such as learning words without the context and memorization of word-by-word translation have still been encouraged by the instructor and widely used in the classroom. The students' inclination towards DDL tasks is firmly based on these previous language learning experiences in secondary school. Based on the data given by this study, the findings from the interviews have suggested that the Japanese students perceived the language learning approaches in different ways, and different approaches provided them with different impacts. The instructor should acknowledge the fact that there are always some students who feel insecure about new ideas and innovative approaches. These results are in accordance with the findings of Jung and Suzuki [17] who suggest the importance of developing teaching methods for the diversity of language learners when using online education.

The findings have suggested that the interviews assist the instructor to understand what individual students thought about the DDL tasks. Only the findings from the interviews revealed the fact that the students' ideas for the future use of *Lex* were constructive and valuable. The instructor should make the most of student thought and ideas on how to accomplish successful DDL tasks. In addition, the interviews encouraged students to engage in critical thinking and reflect upon what they had learned through the tasks. Students can reflect on their learning experiences and differentiate between the benefits and drawbacks. In Japanese educational settings where people have been trained to be modest and not to show off, this kind of opportunity is an excellent way for students to share their opinions with each other regarding the same task they had all completed. It can be concluded that focus should be placed upon more student-centered DDL tasks rather than teacher-centered approaches.

Further study could include a larger sample size and observe how students develop skills for accomplishing DDL tasks for a longer period of time. This will assist the instructor to offer students intensive guidance on tasks and to examine the long-term educational effect on students. The instructor should monitor each student closely while they are doing DDL tasks to develop different kinds of DDL approaches which will work best for different types of students. The exploration of various factors to develop effective DDL approaches for students will result in encouraging them to learn English confidently without a feeling of it being a waste of time and effort. It is hoped that the findings of the present study will contribute to the future development of these approaches.

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Exploring the Influence of Social Ties and Perceived Privacy on Trust in a Social Media Learning Community

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Abstract. Social media has exploded in recent years and new types of interactions happen all the time. People share photos, knowledge, and personal feelings, and receive replies, comments, and feedback. Social media could now be used to build learning communities. However, before this can happen, users must trust the platform and it must protect the privacy of the users. This study explored the determinants of social media trust. It was hypothesized that social ties and perceived privacy influenced users trust in social media. A survey was distributed to 278 undergraduate students. The results showed that social ties had a direct, significant, and positive relationship with trust in social media (β=0.18, $p<0.01$), and perceived privacy had a direct, significant, and positive relationship with trust in social media (β=0.31, $p<0.001$) and with social ties (β=0.28, $p<0.05$). The reduced R-square values for trust and social ties were 0.16 and 0.076, respectively. The implications of these findings are discussed.

Keywords: Perceived Privacy, Social Ties, Trust, Communication, Social Media, Learning Community.

1 Introduction

In the past decade, researchers have investigated the concept of trust in the context of online services. Two crucial factors, sociability and perceived privacy, have emerged from the findings of these studies. However, few studies have used these factors to explain how a website or a social site becomes trustworthy. Therefore, the objective of this study was to explore the influence of social ties and perceived privacy on trust in a social media environment. We set the following research questions: (1) What are the factors affecting users' trust in social networking sites? and (2) What are the relationships between these factors?

The rest of this paper is organized as follows. It starts with a review of the research on online services and trust, and identifies the factors that possibly affect users' trust in social media sites. The next section considers gender and usage on commonly used social sites. The third section develops a model explaining how these factors affect trust. The fourth section describes the instrument used to collect the data and its validation. The fifth section reports the model testing results. The final section

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 134–144, 2013.

discusses the aims of the study and considers how social sites could further enhance users' belief in their trustworthiness.

2 Literature Review and Hypotheses Development

Building trust in social-media based learning communities

Why do social media websites need to generate trust? First, because trust enhances users' experience on social media sites. Trust is defined as "the willingness of a party, instructor, to be vulnerable to the actions of another party, trustee based on the expectation that the other, trustee will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party, trustee" [1, p.712]. In general, trust requires benevolence, integrity, and ability. Given the trend towards more reliance on social media sites, it is not surprising that the issue of trust in the online business environment has already been explored in previous research. In these studies, initial trust beliefs were significantly influenced by initial trust bases such as company reputation, structural assurance, and a trusting stance, and these initial trust beliefs indirectly influenced the users' first purchase intention through consumer attitude. In Technology Acceptance Model constructs, only perceived usefulness directly influenced attitudes towards online shopping systems, and indirectly influenced first purchase intentions. These studies also confirmed that online consumers consider perceived ease of use as a basic requirement for system design [2]. Trust may be interpreted in several different ways; however, in the online business world, trust is closely linked with platform security and credibility [3]. Other studies found that the greater the perceived risk identified by consumers, the lower their intention to use the online system [4, 5]. One way to build trust in the context of a social media environment is to gain a better understanding of how social participation and security measures generate trust. It is expected that trust is a necessary part of social-media based learning communities, as it helps to tie learners together, and to create a safe environment for interactions among community members.

Social ties and trust in learning communities

Personal-level contacts and interactions are fundamental to social networks. According to previous research, personal contacts, frequent interactions, and socializing are all factors that build trust among individuals and organizations [6, 7]. Traditionally, dense social networks, personal contacts, group membership, and social class have been considered the direct sources of trust [8]. In contrast, on online services, people are easily able to share their good and bad experiences with various products and services with a large number of strangers in addition to their friends. These experience-sharing communities try to encourage social interaction among people to facilitate experience sharing and dissemination [2]. Participants form virtual communities and interact via a variety of interactive applications such as social-networking sites, online forums, blogs, and wikis [9]. Peer-to-peer interaction and socialization are vital parts of the online experience [10-12] and enhance the level of trust and satisfaction. Previous studies have indicated that among bloggers, trust, strength of social ties, and reciprocity all have a positive effect on their knowledge-sharing behavior [13]. Interestingly, Hung and colleagues [14] identified relational need fulfillment as a factor in interpersonal trust and platform credibility. Overall, it seems that the level of trust is rooted in sociability. Previous studies have also examined the issue of trust in relation to inaccurate self-presentation and self-disclosure [15].

Perceived privacy, social ties, and building trust in learning communities
Recent studies have suggested that perceived security may facilitate the building of trust in the context of banking services and other customer-based online services. The studies have shown that improvements in security measures increase customer trust and loyalty [16, 17]. Trust and commitment to a specific service largely depend on perceived privacy and security. In a study of an online business information system, the most influential factor in customer trust was the security of the system, followed by the degree of privacy protection [3]. In today's online environment, marketers of social networks must upgrade their privacy and security policies to develop users' trust in their online social network services [18].

However, previous studies have focused on the business sector and the field of marketing. This study examined the influence of perceived privacy among individual learners in a social media learning environment. According to previous studies, social ties on blogs are related to the perceived strength of a blogger's social relationships with other bloggers. Such ties may be strengthened (or weakened) over time based on the length and the frequency of interactions [13]. The same study also showed that strong social ties in cyberspace make bloggers more trustworthy and promote knowledge-sharing practices in the blogsphere. In addition, strong privacy policies may have a significant direct positive effect on male bloggers' urge to share knowledge, as shown by our results [13].

Therefore, we propose the following hypotheses.

H1: *The more social ties an individual has in a particular social media environment, the greater their perceived trust in that social media environment.*

H2: *The greater the perceived privacy in a social media environment, the greater the perceived trust in the social media environment.*

H3: *The greater the perceived privacy, the higher the number of social ties in the social media environment.*

3 Methodology

Background
In this study, the subjects were all undergraduate students using social media tools. They answered a set of questions about their experiences on commonly used social media sites. Social sites such as Facebook, Weibo, Twitter, and blogs, are platforms that allow people to communicate with friends. These platforms are free and open to anyone who registers as a member. As of October 2012, there were more than 600 million users on Facebook, over 500 million users on Twitter, and over 300 million users on Sina Weibo. These social media sites have become closely integrated into

our lives. We used a questionnaire survey to investigate whether trust on these sites is associated with social participation and perceived privacy. The participants were asked to describe how they used the social media, how they perceived the privacy of the tool, and what social interactions they engaged in on this site.

Subjects

A survey instrument was distributed to 380 undergraduate students at a local university in Hong Kong. Two hundred and seventy-eight completed questionnaires were returned (73.16% response rate), comprising 59 students from Year Four, 122 students from Year Three, and 98 students from Year One. This sample not only provides insights into the behavior of university students, it can also represent social media use among the general population.

Measurement items

The questionnaire was adapted from a previously validated scale. Specifically, three items exploring trust (TRUST) [19], four items exploring social ties (SOCTIE) [20, 21], and three items exploring perceived privacy (PPRIV) [22, 23] were included in the questionnaire. All of the items were measured on a 7-point Likert scale, with 1 as “strongly disagree” and 7 as “strongly agree.” The subjects were also asked to self-report on their usage of the most common social media. They were asked to assess their use according to three categories: frequency per month, duration per month, duration of each login. The degree of current computer usage was also measured using a 7-point Likert scale. In the first part of the questionnaire, the subjects were asked to give their demographic data, including sex, age, net knowledge, and number of years since they started to surf the net.

Data Collection

The questionnaires were printed and distributed to all of the undergraduate students at a local university. Most of the questionnaires were completed within 10 minutes and were collected by instructors in each class. The respondents came from different years of study.

4 Findings

Descriptive statistics of respondents

Two hundred and seventy-eight respondents completed the questionnaire. The details are summarized in Table 1. Not all of the respondents were reported in some questions.

Table 1. Descriptive Statistics of Respondents (*N=278*)

Items	Descriptive Statistics
Gender	Male: 60 (21.7%); Female: 217 (78.3%)
Age (18-25)	Mean (Std Dev): 20.63(1.450).
Internet knowledge	1. Beginners: 5 (1.8%); 2. Fair: 95 (34.4%); 3. Good: 159 (57.6%); 4. Expert: 17 (6.2%).

Table 1. *(Continued)*

Internet experience	1. ≤3 year: 6 (2.3%); 2. >3 years: 263 (97.8%)
Social media usage (Number of times last month)	1. Many times per day: 237 (85.6%); 2. Once per day: 31 (11.2%); 3. Less than once per day: 9 (3.2%).
Social media usage (Total hours last month)	1. More than an hour per day: 107 (38.6%); 2. One hour per day: 92 (33.2%); 3. Less than one hour per day: 78 (28.1%).
Social media usage (Time for each login)	1. >30 min: 63 (22.7%); 2. 20-30 min: 42 (15.2%); 3. 10-20 min: 100 (36.2%); 4. <10 minutes: 71 (25.7%).

Descriptive analysis of variables

The descriptive statistics of the measurement items are shown in Table 2. All of the items were mildly negative to mildly positive; all of the mean scores were clustered in the middle. They ranged from 3.27 to 5.05, and the standard deviations ranged from 1.071-1.362.

Reliability and validity testing of the variables

We tested the reliability and validity of the instrument. Validity is the degree to which a measure accurately represents what it is supposed to represent, and reliability is the degree to which an observed variable measures the "true" value and is "error free" [24]. Cronbach's alpha is generally the most appropriate reliability measure for survey research that involves a range of possible answers for each item [25]. All of the constructs met the reliability criteria (alpha>0.70) recommended in the literature [26].

Table 2. Descriptive Statistics of the Variables

	Mean	**Std. Deviation**	**Cronbach's Alpha**
Trust (TRUST)			0.828
TRUST1	4.00	1.071	
TRUST2	3.27	1.232	
TRUST3	3.81	1.115	
Social Ties (SOCTIE)			0.851
SOCTIE1	5.05	1.265	
SOCTIE2	4.64	1.243	
SOCTIE3	4.77	1.127	
SOCTIE4	4.87	1.199	
Perceived Privacy (PPRIV)			0.726
PPRIV1	4.41	1.362	
PPRIV2	4.13	1.233	
PPRIV3	3.93	1.278	

Instrument validation

Discriminant validity is demonstrated if an item correlates more highly with items within the same factor than with items in a different factor [27]. The inter-item Pearson correlation coefficients shown in Table 3 depict a discriminant validity in which the inter-item coefficients within each measurement construct are much higher than the correlations across constructs.

Table 3. Summary of Goodness-of-Fit for SEM Testing

	TRUST1	TRUST2	TRUST3	SOCTIE1	SOCTIE2	SOCTIE3	SOCTIE4	PPRIV1	PPRIV2	PPRIV3
TRUST1	1.00									
TRUST2	0.522	1.00								
TRUST3	0.677	0.661	1.00							
SOCTIE1	0.240	0.143	0.173	1.00						
SOCTIE2	0.173	0.082	0.133	0.634	1.00					
SOCTIE3	0.192	0.127	0.197	0.538	0.496	1.00				
SOCTIE4	0.192	0.044	0.153	0.542	0.672	0.647	1.00			
PPRIV1	0.138	0.121	0.138	0.117	0.075	0.183	0.169	1.00		
PPRIV2	0.252	0.275	0.227	0.152	0.149	0.203	0.188	0.417	1.00	
PPRIV3	0.206	0.258	0.248	0.084	0.125	0.112	0.136	0.371	0.650	1.00

Note: n-s is non-significant

The factor components were then analyzed using a principal component factor analysis with a Varimax rotation method (see Table 4). The components generated confirmed the corresponding constructs. The percentages of variance explained by the components ranged from 9.568% to 52.590%. The total variance explained by all three components was 77.121%. All of the items had high factor loadings within their corresponding components (>0.7), and thus exhibited convergent validity [24]. The cross loading test also passed, as no factors were cross-loaded (>0.2) across the components and each variable was distinct from the others, thus exhibiting discriminant validity [24].

Table 4. Factor Analysis

	Component		
	1	2	3
TRUST1	0.171	**0.822**	0.102
TRUST2	0.011	**0.832**	0.156
TRUST3	0.114	**0.893**	0.106
SOCTIE1	**0.809**	0.137	0.041
SOCTIE2	**0.844**	0.055	0.049
SOCTIE3	**0.781**	0.108	0.137
SOCTIE4	**0.863**	0.039	0.121
PPRIV1	0.119	0.011	**0.715**
PPRIV2	0.106	0.184	**0.840**
PPRIV3	0.043	0.176	**0.826**
Eigenvalues	3.55	2.03	1.46
% of variance	35.5	20.3	14.6

Model testing using structural equation modeling

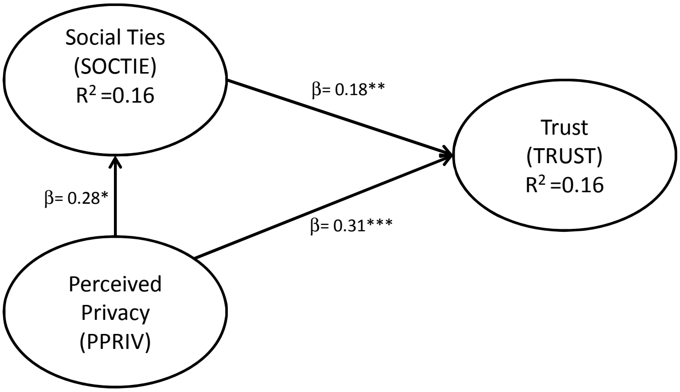
LISREL is a software program designed to estimate and test statistical models of linear relationships among latent and manifest variables using structural equation modeling, an extremely powerful technique that has been used extensively in research [11, 28, 29]. LISREL was used to analyze the survey data and to test the model.

Table 5. Summary of Goodness-of-fit Indices

Chi-sq/df (<3)	SRMR (<0.08)	RMSEA (<0.1)	GFI (>0.9)	AGFI (>0.9)	NFI (>0.9)	NNFI (>0.9)	IFI (>0.9)	CFI (>0.9)
1.64	0.042	0.044	0.97	0.94	0.96	0.98	0.98	0.98

The model fit the data well, and all of the goodness-of-fit indices exceeded the minimum values recommended in the literature [24] (see Table 5).

The Social Ties variable had a significant, direct, and positive effect on Trust in Social Media, with a standard path coefficient of 0.18 ($p<0.01$). This coefficient suggested that every unit of increase in Social Ties strengthens an individual's (positive) Trust in Social Media by 0.18 units. Perceived Privacy had a direct and significant positive effect on Trust, with a standard coefficient of 0.31 ($p<0.001$). This coefficient suggested that every unit of increase in Perceived Privacy strengthens an individual's (positive) Trust in social media by 0.31 units. Perceived Privacy had a direct and significant positive effect on Social Ties, with a standard coefficient of 0.28 ($p<0.05$). This coefficient suggested that every unit of increase in Perceived Privacy strengthens an individual's (positive) social ties in social media by 0.28 units. The R square values showed that Perceived Privacy and Social Ties explained 16% of the variance in Trust and that Perceived Privacy can explain 7.6% of the variance in Social Ties (see Figure 1).



**p<0.05, ***p<0.001*

Fig. 1. Model of Test Results and Path Coefficients

5 Discussion

Social Ties and Social Media Trust

Social Ties had a direct and significant relationship with Trust. This result supported hypothesis (H1). Traditionally, dense social networks, personal contacts, group membership, and social class have been considered the direct sources of trust [9].

Theoretically, social ties can now be measured as users' perceived strength of social relationships with other users. These social ties are largely driven by perceptions about the closeness of their relationships. Such ties may be strengthened over time by the length and frequency of interactions [13]. This result supports the idea that the more social interaction there is between users, the more likely they are to build relationships on the platform. The willingness to use social media enhances the formation of trust in the social media platform.

Perceived Privacy and Social Media Trust

Perceived Privacy had a direct and significant relationship with Trust, which supports H2. Privacy is a fundamental concern of customers who want to shop over the Internet [30]. These results show that the individual user finds social media sites trustworthy and secure. Also, the more users believe that their data is confidential, the more reliable they perceive the social media platform to be. Clearly, the perception of privacy has a powerful influence on trust.

Perceived Privacy and Social Ties

Perceived Privacy had a direct and significant relationship with Social Ties in the use of social media, which supports H3. Perceived privacy enhances social ties by reducing online information privacy concerns, and eventually increasing users' interactions on the social media platform. This is an important finding for social media platforms, as it suggests that developing a well-structured privacy policy will enhance users' interactions on the platform. Thus these policies could help social media sites to maintain their popularity in the long run.

Social Media Trust

There are many factors that affect trust in a social media platform that were not included in this study; for example, perception of online activities or brand and company reputation. Trust should also be considered in connection with communication, commitment, and satisfaction. Future research could explore how these functionalities affect the formation of social media trust. Furthermore, this study focused on the perception of trust as it is attached to social media. Previous research has suggested that user satisfaction could be increased by increasing the level of trust [31]. This could be an area for future research.

Limitations and further studies

There were a number of limitations in this study. Although we believe that undergraduate students are a good proxy for the general user population, as teenagers are very active users of social media, further studies are needed to determine the generalizability of the results. The sample in future studies should be diverse in terms of age and work experience. In addition, there are other aspects of social media use and social media satisfaction that could be related to trust. Future research could also examine business environments to gain insights into perceived privacy in other contexts.

6 Conclusions

This study examined three constructs: social ties, perceived privacy, and social media trust to explain how trust can be built through social interactions and privacy control in social media platforms. The results showed that social ties and perceived privacy were key determinants in predicting users' levels of social media trust. This study provides a concrete model with empirical evidence to support further studies of this phenomenon.

Appendix. Measurement Items Used in the Study

Construct (Sources) – Measurement Items	
Trust (TRUST) [19]	
TRUST1:	Social Media conducts customer transactions fairly.
TRUST2:	Social Media is fair in its use of private user data collected during a transaction.
TRUST3:	Social Media is fair in its customer service policies following a transaction.
Social ties (SOCTIE) [20, 21]	
SOCTIE1:	I maintain close social relationships with other people using social media.
SOCTIE2:	I spent a lot of time interacting with other users.
SOCTIE3:	I know other users on a personal level.
SOCTIE4:	I have frequent communication with other users.
Perceived privacy (PPRIV) [22, 23]	
PPRIV1:	The availability of a privacy or a security statement was clearly stated on the website
PPRIV2:	This social media website has a policy on privacy or security.
PPRIV3:	I am aware of the details of this website's privacy or security policy.

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Making the Right Connections: Challenges for the Educator and Learner

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Abstract. As a result of the ever increasing popularity and expansion of the Internet and web technologies, learning and teaching is being transformed. This brings both benefit and risk. The aim of this paper is to focus on the associated risks as ICT continues to be embedded in the curriculum. Although excellent practice can be cited there are still clear challenges in three major areas, namely, the digital divide, appropriate staff development for all staff and the issue of e-safety and the curriculum. This paper is part of a long term study by the authors in monitoring how the use of technology can become an integral part of teaching and assessment and central to the development of, and engagement with curriculum.

Keywords: ICT, Digital divide, Curriculum, Staff Development.

1 Introduction

As a result of the ever increasing popularity and expansion of the Internet and web technologies, learning and teaching is being transformed. This brings both benefit and risk. Traditional teaching methods are being challenged in this context and a reappraisal of the role of the teacher is continuously being undertaken [7, 16, 18, 20, 26, 28, 30]. There is need for effective staff development of teachers. The situation at present in many UK schools and universities is that most teachers/lecturers focus on content, are experienced in face to face teaching, but have little pedagogical training and experience of facilitating learners on-line or of developing content that is appropriate to an online environment [19]. Conrad [7] reveals a similar pattern in teachers at a Canadian university, " ….instructors had very little knowledge of the new medium…and relied heavily on their face-to-face experiences… they revealed very little awareness of issues of collaborative learning" and a research review published by OECD on Information Communication Technology (ICT) in Initial Teacher Training in 11 countries, reports that 'ICT is not used regularly or systematically' [9]. This paper considers some of the challenges that face educators as they attempt to keep up with learners' knowledge and experience of ICT and the world of collaborative technologies.

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 145–154, 2013.

2 Aim

The aim of this paper is to focus on the associated risks as ICT continues to be embedded in the curriculum. Although excellent practice can be cited there are still clear challenges in three major areas, namely, the digital divide, appropriate staff development for all staff and the issue of e-safety and the curriculum. This paper is part of a long term study by the authors in monitoring how the use of technology can become an integral part of teaching and assessment and central to the development of, and engagement with curriculum. Papers have been published by the authors on the changing role of the teacher and ICT, learner perspectives on how ICT is used and technology as a tool for collaborative learning. Technology offers flexibility, the opportunity to capitalise on the technology skills that students use outside the classroom such as Web2.0 and mobile technologies; but increasingly we must protect both teachers and pupils.

3 Context

The University of Glamorgan was an 'innovator' in terms of its desire to explore the potential of e-learning as a tool for transforming learning and teaching [22], adopting Blackboard as its VLE in 1998 and leading on a major European funded project, *E-College Wales*, between 2001 – 2005 which was aimed at developing a series of online modules and programmes.

At the start of E-College Wales it became clear that we needed to provide staff development in blended learning pedagogy but in 2000, at the start of our journey into e-learning, there were very few examples of staff development programmes supporting e-learning initiatives. Gilly Salmon, then at the Open University in the UK had just developed a model for teaching and learning on-line and we enlisted her help in developing our staff. Salmon devised a staff development programme for us based on her five-stage model in order to help inform, what at that time, was a group of 'naïve' and inexperienced e-moderators. BlackBoard was the chosen managed learning environment (MLE) which provided the platform for communication. What was not really an issue at the start of our work were the potential risks of an on-line learning environment.

4 Literature Review

The need to develop a strategy for the effective use of technology in education has dominated educators' thinking for many years and is reflected in the then Department for Education and Science (DfES) e-strategy, Harnessing Technology [1] and more recently in the Welsh Government's strategy Delivering a Digital Wales [33], which includes reference not only to a redefinition of how learning and teaching takes place in the 21st Century and the need to ensure that 'education is made more effective and efficient through greater connectivity and the possibilities of emerging technologies' [33], but also to the need to develop high level ICT skills amongst teachers.

Ertmer & Ottenbreit-Leftwich [10] report however, that in spite of investment in technology and indeed, increasing evidence of technology being used in the classroom, use tends to support 'traditional, teacher-directed instruction' or the development of ICT skills, rather than to foster the higher-level learning that is facilitated by student-centred learning.

The importance of effective staff development provision is a dominant theme throughout the research literature [1] and it is increasingly recognised that good quality training has the potential to break down many of the perceived and actual barriers to using ICT in learning and teaching. Crucially however, if ICT is to become transformational, staff development should not be limited to what Volman [32] describes as 'learning about computers', or what Bell & Bell [2] refer to as a 'driving lesson approach'. Rather, a strategy must be adopted which facilitates the 'creative use of ICT in subject teaching' [14] and encourages good pedagogical practice [8, 27]. A number of authors explore how this might be achieved and recurrent themes include the importance of collaboration and the need to establish communities of practice [8, 13, 14], the existence of a positive and supportive culture within the school environment [8, 13], the attitudes of teachers themselves towards technology [8, 10, 11]. There is however, conflicting evidence with regard to how teachers' ICT skills impact on their ability to integrate technology effectively. Becta [1] reports that there is a direct link between ICT competence and a teacher's willingness to use computers for learning and teaching. Yet, Drent & Meelissen [8] report that 'the influence of ICT competence on the innovative use of ICT 'is limited' and while 'It seems that ICT competence is a necessary condition for the use of ICT, […] to implement innovative use of ICT, other factors are much more important.'

Other researchers reflect on the need to incorporate effective instructional design principles into online course development [5, 29] focusing on considerations such as learning outcomes, assessment, the appropriate choice of media and the needs of the learner. Traditional instructional design models have their roots however, in behaviourism and programmed learning [12] and while such models might have been appropriate in the early days of open learning, the opportunities afforded by networked learning, including increasing use of Virtual Learning Environments and the exponential growth of social media, a new model of instructional design must develop which takes into account shifting pedagogical approaches and the need to facilitate collaborative learning [3].

With the increased availability and integration of collaborative technologies, educators have an increasing responsibility to help learners use these technologies appropriately. The DfES e-strategy, Harnessing Technology [1] stressed that:

"..... learners of all ages need to develop digital literacy skills that help them to become safe and responsible users of new technologies, and allow them to be discriminating users of both the content they discover and the contacts they make when online"

Two studies in the UK are particularly significant in this area. The ESRC funded project UK Children Go Online (UKCGO) investigated 9–19-year-olds' use of the internet between 2003 and 2005. The study Livingstone and Bober [21] considered a range of factors including access to the internet, the nature of internet use, inequalities and the digital divide, education and literacy, communication and participation. The research found that: children lack key skills in evaluating online content and 30% of those surveyed had not been taught how to use the internet. 75% wanted to see more and better teaching and guidance in schools while 67% wanted more and better information and advice for parents. The survey also highlighted a demand for improved technology: 66% wanted improved filtering software, 54% improved parental controls and 51% improved monitoring software. The digital divide was still sited as a significant issue. Socio-economic status continues to matter. The report talks about a continuum of digital inclusion and exclusion with the locus of inequality shifting from technology access to quality of use (as assessed by time use, skills and range of online activities)

The UKCGO evidence shows, many children, parents and some teachers lacked basic education and awareness in relation to e-safety issues, and that schools were very different stages in their approach to e-safety.

A more recent report by NFER [24] does provide a more positive picture about e-safety in particular. The survey involved teachers in schools in the maintained sector in England. 1315 teachers engaged in the survey 54% were from Primary Schools and 46% from Secondary Schools. Encouragingly 90% of primary schools and 82% of secondary schools had an e-safety policy but only 68% of teachers in the sample felt that they had received adequate training about e-safety and there was limited discussion about how to integrate this into the curriculum. The findings conclude that technology is creating challenges for teachers. This is in relation to issues around e-safety and cyberbullying as well as managing pupils' usage of particular technologies, such as smartphones and social networking sites. Given the pace at which new technologies are being developed, and pupils enthusiasm for using new technologies, having a regularly updated e-safety policy that provides a clear framework for guiding and managing pupils' use of technology is important. The two studies discussed focus on the English experience and there is a need for a specific study in the Welsh context.

5 Methodology

The paper is based on a qualitative approach and was undertaken in a spirit of co-operative inquiry [15]. The research team has worked with different stakeholders to consider what the current challenges are to using ICT. The stakeholders included:

a) An expert panel of educators experienced with different aspects of educational practice,

The main method of data collection of this group was desk-based research analysing published information (research papers, government reports etc.) which consider appropriate approaches to learning and teaching with students from disadvantaged communities. In addition the team itself has many years experience of teaching non-traditional students from disadvantaged backgrounds

b) Tutors and students from two postgraduate teaching courses run by the university. The main method of data collection was through the use of focus groups

c) Students on an undergraduate education course who have undertaken two placements in a school. The main method of data collection was through class discussions

In addition, a critical analysis of policy documentation and an examination of existing research has been undertaken in order to highlight the challenges which must be incorporated into staff development for educators in the region.

The discussion section of the paper will focus on keys themes that reflect the literature and conversations had with the key stakeholders.

6 Discussion

Over the 12 year period that the authors have worked in this area, it is interesting to note that some of the challenges faced at the start are still an issue. There are still teachers unsure how to use technology in the classroom and there is still a digital divide in the UK particularly in socially deprived areas.

The more recent issues are that innovations in technology are providing opportunity but this is proving to be risk for educators as their role in the classroom is being challenged by more 'expert' learners and collaborative technologies can expose learners to risk if not managed and understood properly

By combining the secondary and primary research, the research team identified the following three themes; digital divide, e-safety and staff development. These will be discussed in turn in the next section.

6.1 Meeting the Challenges of Learning and Teaching within Digital Divides

In Wales, there are two significant types of digital divide: access to technology at one end of the continuum and the digital divide that exists between some learners and teachers at the other end.

In March 2010, the Learning Innovation Expert group was commissioned by the Department for Children, Education Lifelong Learning and Skills (DCELLS) to investigate innovative pedagogies for the Post Compulsory sector. The group was asked to produce a series of recommendations after exploring national and international research on engaging students in disadvantaged communities with learning opportunities including work-based learning.

The Expert Group (including the authors of this paper) conducted an analysis of secondary data of projects and literature that have looked at the challenges of developing a curriculum that is relevant, creative and engaging for students who have not and do you feel able to engage with existing education provision. Technology enhanced learning was identified as a key theme. It should be noted that the geographical area being looked (The Heads of the South Wales Valleys) was one of severe social deprivation and access to technology could not be assumed particularly for older learners. Although technology is cheaper and more accessible it is still not easily available to all.

When the tutors and students in the sample were asked about the digital divide some cited access as an issue in some areas but more were concerned about the digital divide that existed between educators and learners. The undergraduate students were asked to look at the table below and comment on their experience:

	Instructive	Constructive
Classroom Activity	Teacher centred Didactic	Learner centred Interactive
Teacher Role	Fact teller Always expert	Collaborator Sometimes expert
Student Role	Listener Always learner	Collaborator Sometimes expert
Instructional emphasis	Facts Memorization	Relationships Inquiry and Invention
Concept of knowledge	Accumulation of facts	Transformation of facts
Demonstration of success	Quantity	Quantity of understanding
Assessment	Multiple-choice items	Criterion referenced
Technology Use	Drill and practice	Communication, collaboration, information access, expression

Fig. 1. ICT in Teacher Education: A planning guide [31]

Their observations illustrated the different perspectives of student and teacher. The students with their mobile technology and experience of Web 2.0 commented on the limited practice they were seeing in some schools. The use of the interactive white-boards was prevalent but from their observations they felt there was little in terms of innovative practice. Many teachers were adopting an instructive approach. They also noted that the learners were the innovators and worked with the technology in a more 'natural way'. This shift in role as to who is the expert and how this is managed effectively in the classroom needs addressing.

The tutors on the postgraduate course felt that their students were mainly aware of how to use technology in a basic way but needed guidance on the pedagogies that support technology enhanced learning. The tutors aim is to develop a module which goes beyond a mainly practice base to a more sophisticated use based on sound pedagogic principles. The tutors felt ICT should facilitate the transformation of teachers' traditional roles and functions and ideally encourage more collaborative and participative forms of learning.

6.2 Safe Technology Based Learning Environments

Technology offers flexibility, the opportunity to capitalise on the technology skills that students use outside the classroom such as Web2.0 and mobile technologies. Collaborative technologies provide so many possibilities to improve communication, support innovative approaches to learning and access to information. However this does not come without risk and both the staff and student in the sample expressed concerns about learner and educator safety.

Learners must be empowered with the knowledge to be safe when they go online, and educators must have a good understanding of what safe means in any context to do with technology. A content analysis of the web sites of 141 primary and secondary schools in RCT was undertaken as a method to make some initial judgements on their engagement with the concept of e-safety. Only 4 of the Schools looked at made specific reference to an e-safety policy and this seems to be in sharp contrast to findings of the NFER [24] report in England. There was mention of safeguarding children but very little discussion in relation to the ICT curriculum. Ofsted [25] has produced a handbook which provides very clear guidance on the need for all teaching and non-teaching staff to be able to recognise e-safety issues. There is a drive for accredited training and the development of a progressive e-safety curriculum. From the findings of the content analysis there is need for a more in depth discussion with schools and a potential need for staff development across the sector. Tutors in the sample agreed that learners must be made aware of how to behave responsibly on-line and not put themselves at risk and also be far more discriminating in the sources of information that they used. The undergraduate students showed some awareness of e-safety policies in their schools but commented how skilled even the younger learners were at working around safety controls that schools had put in place.

6.3 Does ICT Add Value to the Learning Experience?

The Learning Innovation Expert Group concluded that ICT could add value but only if appropriate access could be provided and curriculum was carefully designed. This was supported by the tutors who stressed that it can improve traditional learning activities but only if educators have a solid grounding in the pedagogy and ICT and that curriculum is carefully designed. The students felt that ICT could be a good motivator for some but did express concern that ICT should not be overused at the expense of developing key skills such as handwriting. This was an unexpected comment for a technology orientated generation. Both the tutors and students commented on over-reliance on the internet for all information and that it was important to be discriminating when choosing information. The students were aware of their own dependence of 'everything' being available on-line.

7 Conclusion

One of the many problems facing teachers at this time is that they need to be ready for the next educational development whilst responding to the needs of learners today. Making the right connections is about using technology in the most effective and appropriate way. We are in a vortex or to use Bonk's [4] metaphor we are still in the middle of a perfect storm. As Jones et al [18] observe 'The eye of the storm lays on the revisit and (re)design of the curriculum empowered by educational technology – a thoughtful integration of technology and conventional face-to-face learning and teaching'. All of the groups in the sample agreed that this 'thoughtful integration' was critical.

The next stage of this research is to provide a revised staff development programme which addresses the challenges outlined in the paper. It is important to ensure that all staff have the appropriate skills and understanding to:

- make best use of technology to support and enhance learning and teaching;
- create a safe environment for learners where they feel comfortable and develop a relationship based on trust with the tutor(s)
- develop an understanding of flexible approaches to delivery, assessment and feedback.

The two key factors are:

- Introduce the concept of a 'blended learning continuum' [17] to encourage the teachers to think about the extent to which they should incorporate technology into their teaching;
- Guide teachers in good practice in e-safety for online learning and teaching and how this can be integrated into the curriculum.

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An Exploration of Student Satisfaction in Online Accounting Courses

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Abstract. Online learning management systems potentially offer enriched learning environments with higher learner autonomy and more interactions among learners than traditional classrooms. Using learning motivation and individual student characteristics as variables, we developed a user satisfaction model for an online learning network. This model was empirically tested on undergraduate students who were enrolled in online accounting courses that used the Interactive Learning Network (ILN) platform. The results showed that there were significant relationships between learning platform features, accounting (subject) features, and satisfaction, but the relationship between learner motivation and learner satisfaction was not significant. The proposed online learning satisfaction model explained 58 percent of the observed variance. The implications of this model are discussed.

Keywords: deep learning, career orientation, motivation, student characteristics, accounting learning, online learning management system.

1 Introduction

Technology is now well integrated into classrooms and workplaces and assessing the effects of various technologies on human behavior is a common research focus. For example, some studies have suggested that a technology-supported learning environment increases an individual's intrinsic motivation [1]. A number of theories have been developed to explain how technologies are adopted and used. The technology acceptance model [2] focuses on the perceived usefulness and perceived ease of use of a technology; the theory of reasoned behavior [3] depicts how beliefs about a technology change attitudes and hence, behavioral intentions; and social learning theory [4] suggests that new technologies, like most human behavior, are learned through modeling. Each of these theories focuses on a different aspect of the process such as features of the technology, social norms, individual attitudes, or modes of learning. Li and Ma [5] suggested that media-assisted learning needs to be examined from a number of perspectives and this suggestion is supported by classical theories of learning. For example, Mayer [6] argued that learning outcomes are affected by learning materials,

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 155–166, 2013.

instructional methods, and learner characteristics. Similarly, Kozma [7] distinguished a number of different mechanisms through which different types of media can support learning, including cognitively relevant characteristics of the technology, symbol systems, and processing capabilities. Thus, the objective of this study was to develop an integrated online learning model that included various aspects of learning that could be used to explain online learning. The specific research question was as follows:

What are the factors affecting student satisfaction with online learning?

The rest of this paper is organized as follows. The next section summarizes previous research on the factors that affect student satisfaction with online learning. Next, an integrated online learning satisfaction model is proposed and the methodology used to collect data to test the hypotheses is explained. The findings are reported in the fourth section, and the implications are discussed. The paper concludes by acknowledge the limitations of the study, and suggesting areas for further research.

2 Literature Review and Hypotheses Development

Teaching and learning are two highly personalized processes [8]. Both student characteristics and teaching contexts need to be integrated to create a holistic model of learning motivation [5].

Motivation for online learning

Previous research has shown that motivation determines what we learn, how we learn, and when we choose to learn [9]. To design activities that effectively engage students, educators need to know what motivates them to learn. Venkatesh [10] expanded Technology Acceptance Model to include both intrinsic and extrinsic motivations as predictors of intention to use a technology. Studies that viewed motivation as a simple learner attribute did not recognize that individual motivation varies depending on context and time [11]. Thus, new research has focused on understanding and designing learning environments that motivate students to learn [12, 13]. Miltiadou and Savenye [14] suggested using self-determination theory (SDT) to study motivation in online learning environments. SDT classified motivation as a continuum that ranged from extrinsic to intrinsic motivation. SDT identified three innate psychological needs for intrinsic motivation [15]: autonomy, competence, and relatedness [15]. When intrinsically motivated, students did not need external rewards such as good grades. Intrinsic motivation was strongly related to the experience of deep learning, which involved understanding and developing personal meaning [16].

Approaches to learning and motivation

To design activities that motivate students, it is necessary to know how they learn and what motivates them to persist. Previous studies have established a relationship between students' approaches to learning and eventual learning outcomes (including satisfaction) in higher education [17]. Hall et al. [18] asserted that changes in the course environment could lead to changes in the learning approaches taken by students. Schunk et al. [19] supported the idea that motivated learners were more likely to undertake challenging activities, to be actively engaged, to adopt a deep approach to learning, and to exhibit enhanced performance, persistence, and creativity. Given the known strengths of a deep approach to learning, it is likely that students who adopt a deep approach to online learning will be more satisfied. This leads to the following hypothesis.

> *H1*: *A deep approach to learning will have a positive effect on student satisfaction with the online learning platform.*

User satisfaction and online learning platform features

E-learning environments offer frequent and in-depth group interactions of different types such as learners to learners, learners to instructors, or learners to course materials [20]. Contemporary learning platforms allow a great degree of learner autonomy and learners can chose to undertake self-directed learning. For example, Zhang et al. [21] demonstrated that an online learning environment provided a place for community building and knowledge sharing. They argued that such self-directed learning was likely to be more meaningful to individuals than traditional lectures and that it connected learners within a learning community.

According to Hackman and Oldham's [22] job enrichment theory, both the amount of autonomy experienced by the workers, and the presence of relevant and timely feedback can enhance workers' job satisfaction. Adler et al. [23] replicated their study in a classroom setting and found similar results. Therefore, learners' satisfaction seems to be associated with the perception that they can learn at their own pace and can build networks with other learners and the instructors. Thus, we posited the following two hypotheses.

> *H2*: *The student's perceived control and autonomy (personalization) in an online learning platform will have a positive effect on his or her satisfaction with the online learning platform.*
>
> *H3*: *The student's perceived interaction (learning community) in an online learning platform will have a positive effect on his or her satisfaction with the online learning platform.*

Individual learners' characteristics

Hackman and Oldham [22] noted that certain people dislike enrichment and, when offered enriched tasks, might actually exhibit lower motivation and performance. They measured an individual's motivation to perform enriched tasks using a variable they called "growth need strength" (GNS). Adler and colleagues [23] found that high GNS students were more satisfied with an enriched learning setting. As undergraduates are preparing to search for work after graduation and wish to work in professional fields, they are likely to possess high GNS and thus to be more satisfied with enriched online learning environments. Therefore, to examine the relationship between this "growth need strength" characteristic, and satisfaction with online learning, this study used student career orientation as a proxy for the growth needs strength variable.

> *H4: A high "growth need strength" (career orientation) will have a positive effect on a student's satisfaction with the online learning platform.*

3 Methodology

Learning management system – the Interactive Learning Network (ILN)
The respondents were full-time accounting students at a local university in Hong Kong, who used a learning management system called the Interactive Learning Network (ILN) [24]. The ILN was implemented throughout the university and all of the students had access to it. Instructors were encouraged to use it to manage their classes but it was not compulsory to do so. All of the communication tools in the ILN, including General Information, Calendar, Announcement, Resources, Forum, Chat Room, Assignment Submission, Course Evaluation Survey, Contacts, etc. were available to students.

Subjects
For this study, two courses conducted in the 2012 fall semester were selected as a sample. The introductory accounting course was usually taken by business students in the first year of study. The advanced auditing course was a core course for fourth-year accounting students.

Data collection
Hard copies of the one-page, two-sided questionnaire were given to the instructors of the selected classes. The instructors distributed the questionnaires in class and collected them back as soon as the students had completed the questionnaire. Most of the students completed the questionnaire within 10 minutes. All of the data were input into SPSS for further analysis.

Measures
A survey instrument was used to obtain self-reported information from the subjects [25]. The questionnaire was divided into three main parts. The first part collected respondents' basic personal information, including gender, age, year of study, whether they had been interns, and how much they used the ILN. The second part asked respondents for their opinions about their studies, the perceived design of the ILN, the subject they were studying, and finally their satisfaction with the ILN. All of the questionnaire items were adopted from prior validated scales and were measured on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Specifically, respondents were asked to answer 5 items from the Deep Approach to Learning Scale [26]; 4 items from the Perceived Personalization Scale; 4 items from the Learning Community Scale [27]; 5 items from the Growth Need Strength (Career Orientation) Scale [23]; and 2 items from the Satisfaction Scale [27]. The complete instrument and sources are listed in the Appendix.

Data Analysis
The measurement models of the instrument scale were specified. Then, goodness-of-fit was assessed and convergent validity was tested. The structural model was analyzed with respect to the goodness-of-fit indices, using Structural Equation Modeling using LISREL 8.51. The path coefficients and the variance of the structural relationships were estimated.

4 Findings

Descriptive statistics of respondents

The descriptive statistics of the respondents are presented in Table 1.

Table 1. Descriptive Statistics of Respondents (*N=330*)

Items	Descriptive Statistics
Courses	Advanced Auditing (ACCT410) 148 (44.8%) (Accounting major students); Financial Accounting (ACCT100) 133 (40.4%) (Business Admin students); Financial Accounting (ACCT100) 49 (14.8%) (Law & Business students)
Gender	Male – 112 (33.9%); Female – 218 (66.1%)
Age	20 or below – 155 (47%); 21-25 – 175 (53%)
Year of Study	Year 1 – 119 (36.1%); Year 2 – 58 (17.6%); Year 3 – 5 (1.5%); Year 4 – 148 (44.8%)
Internship experience	Yes – 232 (70.3%); No – 95 (28.8%); Not reported – 3 (0.9%)

To understand more about the respondents, the students were asked to report, on a scale of 1 to 5, how frequently they used the ILN, their familiarity with the ILN, and their academic success. The results are shown in Table 2.

Table 2. Self-reported Use of the Interactive Learning Network (ILN)

Respondents' ILN use and academic results	Mean	Std. Dev.
Frequency of use ("1" Never – "5" Always)	3.36	0.741
Familiarity ("1" Poor – "5" Excellent)	3.30	0.777
Academic results ("1" Poor – "5" Excellent)	2.75	0.700

Descriptive analysis of the variables

Table 3 presents the mean responses for the first three constructs, Deep Learning, Personalization, and Learning Community. They ranged from 3.37 to 3.88, lower than the neutral point of 4.0 on a 7-point Likert-type scale. The Satisfaction score was close to 4. The mean responses on the 5-item Growth Need Strength (Career Orientation) construct ranged from 4.60 to 4.85, indicating that students on average possessed positive predispositions toward growth and accomplishment.

Table 3. Descriptive Statistics of the Variables

	Mean	Std. Deviation	Cronbach's Alpha	Factor Loadings	Average Variance Extracted (AVE)
Deep Motive			0.8597		0.55
DEEP1	3.76	1.246		0.77**	

Table 3. *(Continued)*

DEEP2	3.88	1.247		0.82**	
DEEP3	3.61	1.272		0.73**	
DEEP4	3.84	1.239		0.74**	
DEEP5	3.65	1.037		0.65**	
Personalization			0.9042		0.73
P1	3.81	1.240		0.90**	
P2	3.50	1.309		0.92**	
P3	3.62	1.336		0.83**	
P4	3.37	1.253		0.76**	
Learning Community			0.8974		0.72
L1	3.47	1.351		0.86**	
L2	3.44	1.329		0.85**	
L3	3.72	1.397		0.88**	
L4	3.82	1.341		0.79**	
Growth Need Strength			0.9293		0.77
CAREER1	4.65	1.260		0.83**	
CAREER2	4.85	1.286		0.92**	
CAREER3	4.68	1.281		0.90**	
CAREER4	4.81	1.248		0.91**	
CAREER5	4.60	1.266		0.82**	
Satisfaction			0.9007		0.81
SAT1	4.08	1.232		0.89**	
SAT2	3.95	1.314		0.91**	

$^{**}p<0.001$

Instrument validation

Measurement models for each construct were specified with the corresponding items. The measurement models were assessed by confirmatory factor analysis, and structural equation modeling (SEM) using LISREL. Measurement model validity depends on (1) establishing acceptable levels of goodness-of-fit for the measurement model and (2) finding specific evidence of construct validity [28, p.664]. The measurement models for Deep Learning, Personalization, Learning Community, and Career Orientation all exhibited acceptable levels of goodness-of-fit, as suggested in previous studies [28, p.672].

Table 4. Summary of Goodness-of-Fit for SEM testing

Constructs	Chi-square (n-s p-values)	CFI (>0.90)	SRMR (<0.08)	RMSEA (<0.07)
Deep Learning	p=0.22 (n-s)	1.00	0.013	0.037
Personalization	p=1.00 (n-s)	1.00	0.000	0.000
Learning Community	p=0.43 (n-s)	1.00	0.0035	0.0
Career Orientation	p=0.41 (n-s)	1.00	0.0063	0.0

Note: n-s is non-significant

Convergent validity occurs when indicators of a specific construct converge or share a high proportion of variance. In this study, convergent validity was assessed using factor loadings, average variance extracted, and reliability. In the case of high convergent validity, high loadings on a factor indicate that they converge on a common point, i.e., the latent construct [28, p.709]. Factor loadings for each item are listed in Table 3. They were all statistically significant ($p<0.01$) and above the minimum value of 0.70 [28]. A variance extracted is the square of a standardized factor loading; it represents how much variation in an item is explained by the latent factor. The average variance extracted is the mean of all of the variances extracted for all of the items loading on a construct, and is a summary indicator of convergence [28]. As shown in Table 3, all of the AVE were 0.5 or higher, suggesting adequate convergence [28, p.709]. Reliability is an indicator of convergent validity and internal consistency. A coefficient alpha is a commonly applied estimate of reliability [28]. The Cronbach's alpha values, summarized in Table 3, ranged from 0.8597 to 0.9293, well above the threshold value of 0.7 recommended by previous studies [29]. Overall, the constructs exhibited convergent validity.

Model testing using a structural equation model

The structural model and the hypotheses were tested using structural equation modeling using the LISREL program. The model fit was analyzed using the various goodness-of-fit indices. All of the goodness-of-fit indices were either above, or very close to, the recommended threshold values (Hair et al., 2010).

Table 5. Summary of Goodness-of-fit Indices for Model Testing Results

Chi-sq/df (<3)	GFI (>0.9)	NFI (>0.9)	NNFI (>0.9)	CFI (>0.9)	IFI (>0.9)	RMSEA (<0.1)	SRMR (<0.08)
3.4	0.87	0.91	0.92	0.93	0.93	0.082	0.058

The hypotheses were assessed using both the significance and the strength of each of the causal paths. The results are summarized in Figure 1.

5 Discussion

An analysis on the respondents

Both courses were taught in lectures and tutorials that were supplemented with the ILN. The introductory accounting course had traditionally proved challenging to students from every discipline and was perceived as a boring application of mechanical rules [30, 31]. Students' negative perceptions might be a result of their failure to fully comprehend the role played by professional accountants in the business world. Online discussion forums were open for both courses. Although

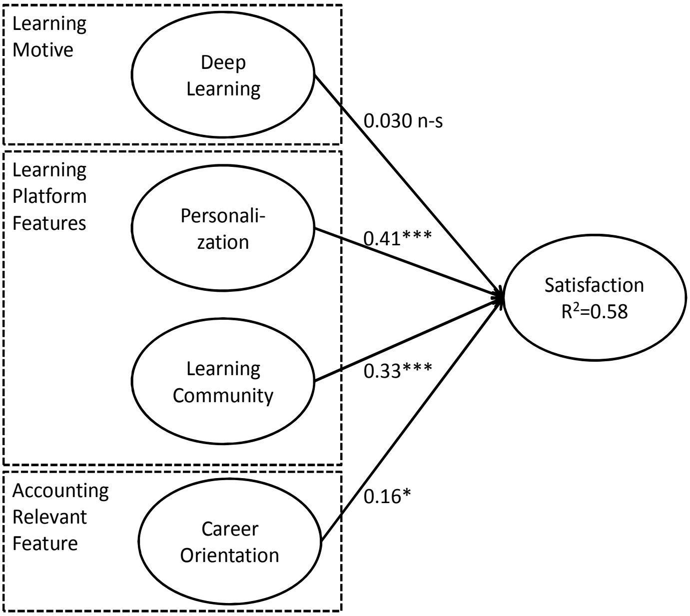

Fig. 1. Model Testing Results for Online Learning Satisfaction Model

$^*p<0.05$; $^{***}p<0.001$

bonus marks were offered for voluntary participation, students only complied with the minimum requirements. Some ACCT100 students remarked that they only used the ILN to download PowerPoint slides and solutions. In casual discussions, some students said that although they appreciated the online discussion forum, they did not actively respond because of the language barrier, the essay-type questions, and their anxiety about making mistakes in public.

Seventy percent of the students reported that they had internship experience. Internships can give students an edge and widen their career choices by providing them with an opportunity to practice what they have learnt. However, internships also divert time away from studying. Professional accounting bodies have urged the university to adopt a curriculum that enhances students' "employability" skills including their analytical skills, critical thinking skills, and communication skills [18, 32].

Learning motivation – Deep Learning

H1, which posited a positive relationship between student satisfaction and a deep approach to learning, was not supported. This might indicate that students lacked intrinsic motivation to learn the subject matter and did not apply a deep approach to learning. A deep approach requires students to invest time and effort into the learning process. Previous studies have indicated that accounting students are likely to adopt a surface approach when the focus of learning is the accumulation of facts or reproducing information [33, 34]. Thus, accounting classes should not focus only on memorizing and regurgitating facts [35]. Teaching methods that expand and reinforce communication, intellectual, and interpersonal skills should be used [35]. Without deep learning students will not develop their critical thinking, problem-solving, communication, and team building skills [34]. The results remind educators to adopt teaching methods that encourage students to use deep learning techniques, for example, to structure learning tasks with clear goals and guidelines [36].

Learning platform features – Personalization and Learning Community
H2 and H3 were supported. Consistent with previous studies [27, 37, 38], both autonomy and interactivity were positively related to student satisfaction with the ILN. A traditional classroom setting allows few opportunities to engage students and does not address students' individualized learning needs. The asynchronous nature of online discussion and writing allows learners to reflect and gives them more time to think "deeply" before giving their opinions [39]. Thus, the ILN provides an enriched learning environment that offers autonomy. It allows students to learn at their own pace and encourages interactions among students.

Growth Need Strength - Career Orientation
H4 was partially supported. The hypothesis proposed a positive relationship between student satisfaction with the ILN and their accomplishments or career orientation. Today, most students have access to a wide range of online media, and educators need to consider students' previous experiences and expectations when designing tasks to engage them.

Limitations and further studies
This study has several limitations. First, our research results were obtained from undergraduate students in a local university in Hong Kong. Second, the proposed model is based only on four constructs. Further studies may extend our model to other constructs. For implementation effectiveness, we may investigate how different designs and applications of online learning systems can reinforce students' intrinsic motivation. Further, we may also explore the potential of the ILN to help students effectively construct their personal motivational strategies [40].

6 Conclusions

Our model had a reasonably good fit with the data and was able to explain 58% of the variance in online user satisfaction. Both online learning platform features and career orientation were found to be significantly related to online learning satisfaction. The findings of this study provide insights that can be translated into teaching strategies that will facilitate personalization and building a learning community that motivates learning.

Appendix A. Measurement Items Used in the Study

Construct (Sources) – Measurement Items	
Deep Motive [26]	
DEEP1	I find that at times studying gives me a feeling of deep personal satisfaction.
DEEP2	I feel that virtually any topic can be highly interesting once I get into it.
DEEP3	I find that studying academic topics can at times be as exciting as a good novel or movie.
DEEP4	I work hard at my studies because I find the material interesting.
DEEP5	I come to most classes with questions in mind that I want answered.
Personalization [27]	
P1	The ILN enables you to learn the content you need.
P2	The ILN enables you to choose what you want to learn.
P3	The ILN enables you to control your learning progress.
P4	The ILN records your learning progress and performance.
Learning community [27]	
L1	The ILN makes it easy for you to discuss questions with other students.
L2	The ILN makes it easy for you to share what you learn with the learning community.
L3	The ILN makes it easy for you to discuss questions with your teachers.
L4	The ILN makes it easy for you to access the shared content from the learning community.
Growth need strength [23]	
CAREER1	I prefer having opportunities for personal growth and development in my university work.
CAREER2	I prefer having opportunities to learn new things from my university work.
CAREER3	I prefer having chances to exercise independent thought and action in my university work.
CAREER4	I prefer having a sense of worthwhile accomplishment in my university work.
CAREER5	I prefer having stimulating and challenging university work.
Satisfaction [27]	
SAT1	As a whole, I am satisfied with the ILN
SAT2	As a whole, the ILN is successful.

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Improving Self-efficacy for Electronic Portfolio Development

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Abstract. This paper discusses the main issues and related studies of electronic portfolio development in education. It presents how a blended learning process on weblog-based portfolio development has been adapted and implemented into one graduate education course. The effectiveness of such a blended learning process on students' self-efficacy has been examined. Discussion and conclusion of enhancing student-oriented electronic portfolio development for educational programs/courses are included.

Keywords: Electronic Portfolio, Learning Tasks, Instructional Strategies, Weblog, Blended Learning Process.

1 Introduction

Educators have long been concerned with the professional portfolio development due to its numerous benefits: fostering self-assessment and reflection, providing personal satisfaction and renewal, providing tools for empowerment, promoting collaboration, and providing a holistic approach to assessment [1]. With the expansion of technology in education, more recent studies have reported the use of electronic portfolios also known as e-portfolios or digital portfolios in teacher education. An electronic portfolio is defined as a portfolio that uses electronic technologies, allowing the portfolio developer to collect and organize portfolio evidences/artifacts in many media types (audio, video, graphics, text) [2]. Comparing to developing paper-based portfolios, there are some major advantages of developing electronic portfolios on: accessibility, portability, storage, creativity, teacher technology skills, self-confidence, and so on [1][3].

Although the benefits and advantages of electronic portfolios are very promising, developing an electronic portfolio is quite challenging in practice: it takes several stages to process – collection, selection, reflection, projection/direction, and presentation [4]; it is time-consuming for students to assemble and for teachers to guide and provide feedback; unfocused instruction and/or ill-defined tasks lead to low reliability for evaluations in portfolio assessment; and the electronic portfolio requires a level of technological skill that not all teachers and students possess [5]. While

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electronic portfolios are expanding in teacher education programs, and the participants are mounting, the question "electronic portfolios for whom?" has been raised. As Ayala [6] argued, "the knowledge promoted under the guise of electronic portfolios is hardly student-centered. Very little research exists integrating student voices into the dialogue of electronic portfolios. The voices that are integrated are primarily those of administrators and some faculty." It appears that self-efficacy, which is defined by Bandura [7] as "the beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations," is essential for students' electronic portfolio development. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave [7]. Therefore, finding ways to improve students' self-efficacy on electronic portfolio development is very much needed.

Accordingly, the present study expands upon earlier research of instructional strategies on learning tasks and the use of weblogs for professional portfolio development by presenting how a blended learning approach on developing weblog-based portfolios has been implemented into one graduate education course. It also examines the effects of such an approach on students' self-efficacy on learning and performance.

2 Related Studies

2.1 Learning Tasks and Instructional Strategies

As the basic instructional unit, tasks can be characterized as well structured and/or ill structured [8][9]. The previous literature has suggested that it is vital to balance these types of tasks. On one hand, excessive well-structured tasks may fail to challenge students, undermine optimal levels of self-regulation, limit cognitive engagement to shallow processing, restrict opportunities for students to establish cognitive resources for high-road transfer, and decrease performance [8][10][11]. On the other hand, a surfeit of ill-structured tasks may increase students' anxiety due to ambiguities about means and ends and be extremely difficult for students to carry out, resulting in withdrawal rather than constructive engagement [8][12].

There are a variety of strategies that have been used to design and implement learning tasks in different learning environments [13]. Forcier [14] developed two models of instructional strategies - linear and non-linear. A linear model is characterized by a direct, sequential and outcome-driven strategy. A nonlinear model is characterized by an indirect, random and process-driven strategy, which allows individuals the room to determine their own path to goal attainment without having a hierarchical structure or predetermined outcome imposed on them [14]. One of our early studies examined how a bilinear instructional strategy incorporating both linear and nonlinear instructional models was designed and then implemented in a graduate applied technology course [15]. The results indicated that using a purposeful combination of both linear and nonlinear strategies within a problem-based approach provided students with dimension of learning that neither one alone can achieve. Students held very positive perceptions toward: usefulness of the course, effectiveness of learning process and learning atmosphere, proficiency in multimedia and Internet, awareness of technology integration on completed projects, etc.

In one of our recent studies [16], we applied the bilinear instructional strategy into a hybrid graduate course that combined face-to-face (F2F) classroom instruction with computer-mediated learning (CML). As shown in Figure 1, a construction with five consecutive stages blended learning process was designed and then implemented. The results verified that pre- and in-service teachers could actively engage in practices of inquiry, design, and research in collaborative groups with an interest in educational technology to design tangible, meaningful artifacts as end products of the learning process. The effectiveness of such an instructional approach on various forms of knowledge among pre- and in-service teachers was confirmed.

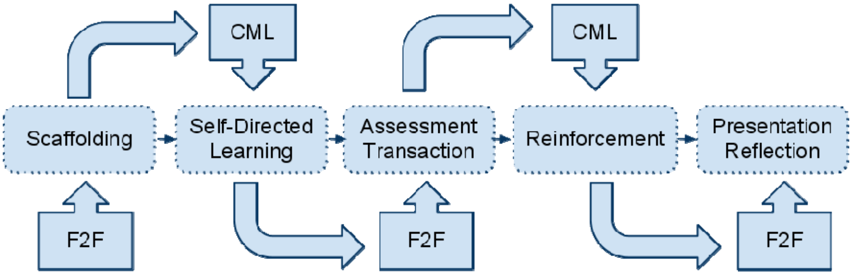

Fig. 1. Five-stage blended learning process

2.2 Weblog and Portfolio Development

Recent Web 2.0 applications such as blogs, wikis, social bookmarking, and podcasts, have emerged in a rich, interactive, user-friendly platform that allow users to read and also to write to the Web [17][18]. As one of most widely used Web 2.0 applications, a Weblog is constantly comprised of reflections and conversations from the developer and viewers; it stimulates interaction [19][20][21]. Ganley [22] noted, "Weblogs, because of their flexibility, their public nature and their rich linking structure, can be a powerful tool in our pursuit of such a classroom. They allow us to visualize learning, contextualize course content, encourage meta-reflective practices, and practice collaboration." Two studies further confirmed and supported this statement. One study conducted by Fiedler [23] examined Weblogs as reflective conversational tools, and found Weblogs supporting aspects of:

- recording and representing one's personal patterns of meaning or actions;
- reflecting upon the representations;
- reiterating the process of explication and reflection;
- shifting from a task-focused level to a learning-focused level of awareness;
- supporting the construction of a personal mini-language to converse about the process of learning;
- supporting a gradual internalization of the tool.

Another study directed by Eide and Eide [24] investigated Weblogs on brain structure and function, and found that Weblogs could:

- promote critical and analytical thinking;
- be a powerful promoter of creative, intuitive, and associational thinking;
- promote analogical thinking;
- be a powerful medium for increasing access and exposure to quality information;
- combine the best of solitary reflection and social interaction.

Weblogs, therefore, have shown a great deal of potential for developing and reforming electronic portfolios in education [25]. To distinguish it from a typical electronic portfolio, a Weblog-based portfolio is usually called a "blogfolio" [25]. As shown in Figures 2 and 3, the differences between blogfolios and typical electronic portfolios are clear: blogfolios show every stage of the process, typical electronic portfolios show the finished outcomes; blogfolios are conversational, typical electronic portfolios are monological; blogfolios open for inputs from outside, typical electronic portfolios are one dimensional starting from inside; blogfolios update constantly, typical electronic portfolios stop from time to time; blogfolios are interactive, typical electronic portfolios are inactive; etc. [26]

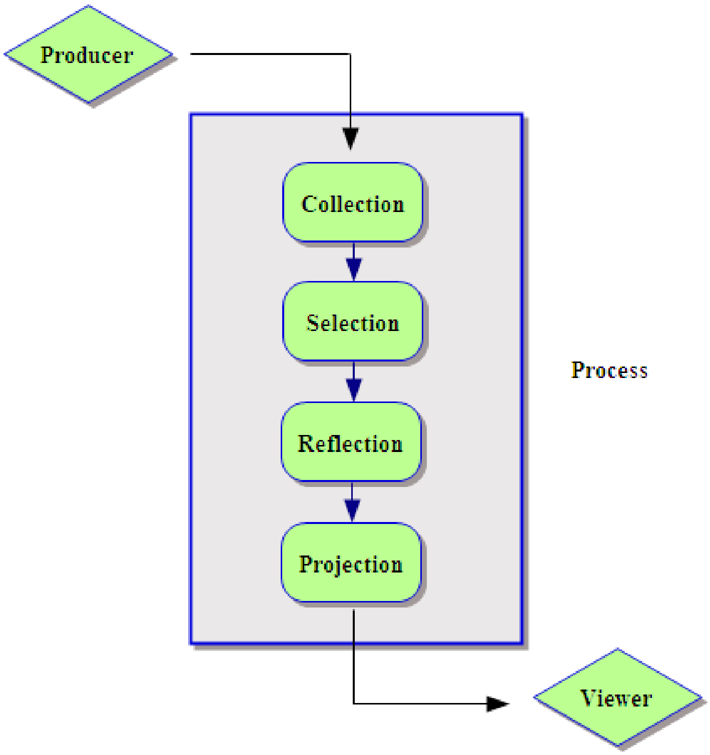

Fig. 2. Typical e-portfolio development

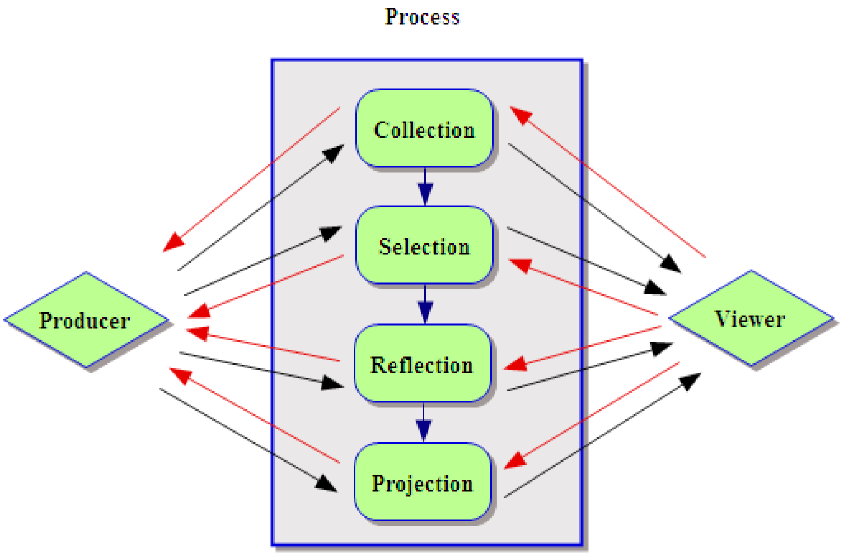

Fig. 3. Blogfolio development

Our previous studies found that developing blogfolios could enhance a sense of community and promote collaboration, communication and interaction, and student-centered assessment and reflection [25][26][27].

2.3 Research Questions

In this study we concentrate on exploring the blogfolio development on building students' self-efficacy through our previous five-stage blended learning process [16] into one graduate education course. The following questions guided this study:

- How could we adopt and implement a blended learning approach, which combined both face-to-face instruction and computer mediated learning, for students' blogfolio development?
- What were the effects of developing blogfolios on students' self-efficacy?

3 Method

3.1 Participants and the Course

The participants of this study came from one section of students (N = 30) who were enrolled in the graduate course entitled *Portfolio Development and Professional Synthesis,* offered at a university in the northeastern region of the United States during the fall semester in 2009 (n = 19) and the spring semester in 2010 (n = 11). Twenty-nine participants were pursuing graduate level education programs in content areas of biology, chemistry, English, literacy, mathematics, social studies, technology, etc. One participant was a visiting scholar from a university in China.

The course *Portfolio Development and Professional Synthesis* introduces pre-service and/or in-service teachers to issues related to professional development especially in terms of personal portfolio development and other professional activities to further support and contribute to the betterment of the filed of education. In this process, portfolio development will serve as the main measure of preparedness and readiness with class activities to support this process. Portfolio development can provide documentation and evidence of the developing teacher's abilities in a multitude of areas, e.g., knowledge of content area, classroom management, supporting diverse student learning needs, etc.

As one of hybrid courses in the university, two-thirds of the course learning activities had been moved to the computer mediated learning (CML) environment while the contact time in traditional face-to-face (F2F) teaching and learning had been reduced to one-third of the course.

3.2 Procedure

As shown in Table 1, the five-stage blended learning process [16] was adapted and implemented into the course, which incorporated linear and nonlinear instructional models in the blogfolio development.

Table 1. Five-stage blended learning process

Stage	Task	Setting	Week
Scaffolding	The concept and foundations of portfolio; performance standards and portfolio development; main components of a teaching portfolio; examples of completed portfolios; guidelines and resources for artifacts and supporting documentation; introduction of weblogs; steps to building a weblog and managing files; etc.	F2F classroom instruction; synchronous communication; well-structured	2
Self-Directed Learning	Individual weblog creation on WordPress; autobiographical sketch/self-introduction; teaching philosophy; review of guidelines and resources; organization of portfolios around performance standards; collection and selection of artifacts; development of support documentation (introductions, explanations, and reflections); etc.	CML; asynchronous communication; ill-structure	5-6

Table 1. *(Continued)*

Formative Assessment & Transaction	Sharing what individuals had done on their ongoing blogfolios; discussion of challenges, questions, and concerns that individuals experienced; acquisition of possible and potential solutions, strategies, resources, and steps to enhance individuals' blogfolios; construction of a rubric for the self- and peer-evaluation; features of WordPress.com appearance (e.g. themes, widgets, menus, header, and related link); etc.	F2F classroom instruction; synchronous communication; well- and ill-structured	2
Reinforcement	Revision and continuation on individuals' blogfolios; selection and addition of professional resources/links; blogfolio design enhancement (professional appearance and personalized production); etc.	CML; asynchronous communication; ill-structure	4-5
Presentation and Reflection	Overview of individuals' blogfolios; self- and peer-review of blogfolios; conversation on use of portfolios for professional growth and development; interviewing skills development and practice; etc.	F2F classroom instruction; synchronous communication; well- and ill-structured	1

For the outcomes of completing five-stage blended learning process, a sample of students' blogfolios is depicted on Figure 4.

3.3 Data Collection and Instrumentation

To assess the effectiveness of the process of blogfolio development on students' self-efficacy, participants from the course were asked to fill out the online Self- and Task-Perception Questionnaire (STPQ) voluntarily at the end of the fall semester in 2009 and the spring semester in 2010. Among the returned surveys, 27 out of 30 students' responses (90 %) were completed and usable.

The STPQ was originally developed by Lodewyk and Winne [12]. It consists of seven statements on self-efficacy for performance and self-efficacy for learning with 5-point scale ranging from 1 (very much not true of me) to 5 (very much true of me). The declaration "Based upon my experience on my blogfolio development -" was added at the beginning of all items for this study. In addition, an open-ended item/box that allowed students to report their learning experiences was added at the end of the STPQ.

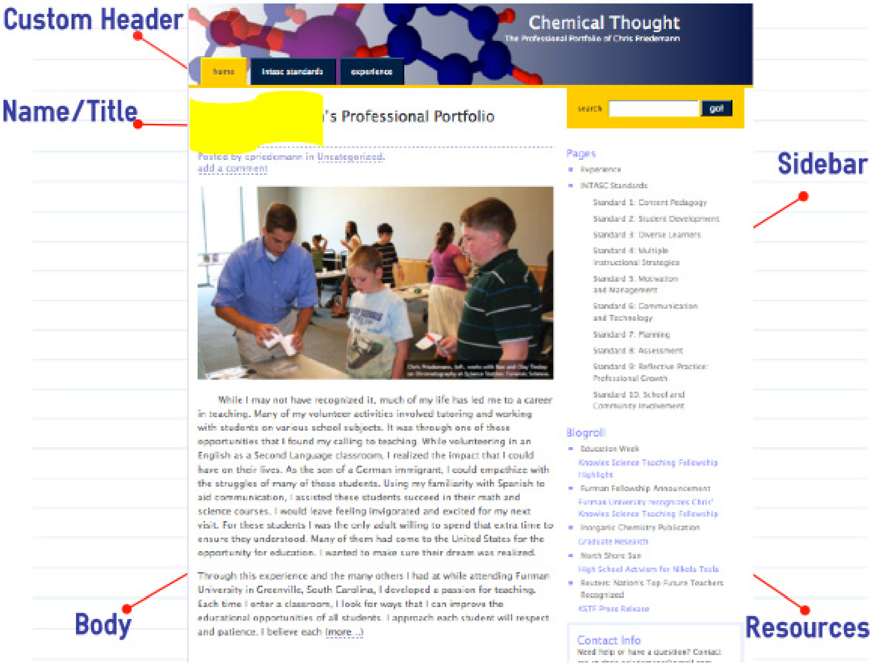

Fig. 4. A sample blogfolio

4 Results

The present study clearly demonstrated positive effects of developing blogfolios through five-stage blended learning process on students' self-efficacy. As indicated in Table 2, very high mean scores were found on both self-efficacy for performance and self-efficacy for learning. These findings correlated with comments from participants on the open-ended feedback box such as, "I think that this process made me reflect on a lot of the assignments that I've done throughout my education and it has been very helpful," "I feel the professional portfolio is invaluable resource to have when I am looking for a job, and gathering the artifacts for each standard made me realize the college has prepared me well for the teaching profession," "I think that the course was very well planned so that the amount of work was evenly distributed throughout the course of the semester. I also liked the opportunity to see the work produced by other students, because doing so provided me with ideas. It was also really great to have learned such a practical skill," "The portfolio will be very important when trying to find a teaching job, but more importantly, the portfolio showed me what I have done so far as a teacher, and what I need to do in the future to continue my professional development," "I am pretty confident that I put together a comprehensive portfolio. And I already have ideas for improving it before the end of class," "Loved it. Given enough freedom to make our own mistakes, yet the instructor was there for you.

We were given an idea and allowed to make it our own. All too often, professors are too strict with what they want and do not let the students make it their own. That was not a problem with this assignment."

Table 2. Respondents' self-efficacy

	Fall (n = 16)		Spring (n = 11)	
	M	*SD*	*M*	*SD*
Self-efficacy for performance				
Knowing the difficulty of this project, the teacher, and my skills, I think I can do well on this project	4.44	.51	4.73	.47
I expect to do well on this project	4.56	.51	4.82	.40
I believe I will receive an excellent grade on this project	4.63	.50	4.82	.40
Self-efficacy for learning				
I'm confident I am learning the basic ideas in this project	4.69	.48	5.00	.00
I'm certain I'm learning the skills necessary for this project	4.69	.48	5.00	.00
I'm confident I am understanding the most difficult material in this project	4.69	.48	4.73	.47
I know which mental techniques would best meet the needs of this project	4.38	.62	4.64	.67

5 Discussion and Conclusions

The findings of this study lead to a couple special considerations for increasing self-efficacy on professional electronic portfolio development.

Firstly, as Bandura [7] indicated, "the most effective way of creating a strong sense of efficacy is through mastery experiences." It is important to balance well- and ill-structured tasks for developing complex and individualized projects such as the professional electronic portfolio development. We find that instructors can build up students' beliefs and skills on developing electronic portfolios through five-stage blended learning process in F2F and CML environment: (1) scaffolding; (2) self-directed learning; (3) formative assessment and transaction; (4) reinforcement; and (5) presentation and reflection. This five-stage integrates student voices into the dialogue of electronic portfolios, as well as fosters intrinsic interest and deep engrossment in activities. As a result, students with high assurance in their capabilities approach the professional electronic portfolio development like as challenges to be mastered rather than as threats to be avoided [7].

Secondly, in order to build stronger self-efficacy through educational programs/courses, an innovative form of student-oriented electronic portfolio development with Web 2.0 applications such as a Weblog, which has enormous capacities of teaching and learning with technology, should be considered and implemented. The effectiveness of the blogfolio development on self-efficacy for performance and self-efficacy for learning has been confirmed in this study.

It should be noted that the sample size of participants in our study was relatively small and the pretest of STPQ was not conducted. We suggest that larger population with pretest and posttest design to be investigated for further research. It should also be note that this study mainly focused on the effects of the five-stage blended learning process for weblog-based portfolio development on students' self-efficacy. We suggest further research should focus on other related topics. For instance, what are the effects of such a blended learning process for developing electronic portfolio on students' learning style and cognitive preference in terms of introversion-extroversion, intuition-sensation, thinking-feeling, and judging-perceiving [28]?

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Exploring the Effectiveness of Hybrid Learning in Accounting Information Systems - An Empirical Study

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Abstract. This paper explores the impact of online quizzes of the textbook companion website (TCW) on students' academic performance. The purpose of this study is to examine if student who has attempted textbook online quizzes performs better in the midterm test and the final exam. It also aims to explore students' experience and perception of textbook supplementary online resources to their learning. The subjects of this study were 150 undergraduate students enrolled in Accounting Information Systems (AIS) in fall semester of 2011 in a private university in Hong Kong. Results indicate that doing online quizzes does appear to have a positive association with the scores of the test and the exam. In general, students have a positive attitude towards TCW and perceived the usefulness of online quizzes, but did not want to make the textbook online quizzes compulsory. Limitations of this study were identified with suggestion on future studies.

Keywords: Blended learning, online quizzes, textbook companion websites, Accounting Information Systems, students' performance, perception.

1 Introduction

With the rapid development in information and communication technology (ICT), a majority of the textbook publisher has replaced the previous paper form textbook supplements with supplementary online websites. These textbook companion websites (TCW) offer learners, sometimes the general public, to use learning materials coordinated with the textbook anytime with no geographical limitation. Typically, the textbook online supplements comprise of PowerPoint slides, quizzes, extra readings or journal articles. But do the supplementary resources really serve to enhance learning?

Lecturers and students might view TCW as an unnecessary expense and not utilize those resources. It is believe that TCW are not in the same way beneficial to all levels of students in all courses. Obviously the cost of the TCW is packed into the price of the textbook. In addition to justify the value of TCW, it is necessary to offer suggestions for the utilization so students would benefit the most from these resources. However, there are limited papers in the education literature have included a discussion about the

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impact of TCW on student learning [1]. Such research in accounting education does not exist; hence this study addresses this gap for an accounting course.

The focus of this study is on the effectiveness of TCW, specifically the online quizzes component, to students' academic performance in an Accounting Information Systems (AIS) course. The purpose of this study is twofold: (1) to examine if there exists any association between attempting textbook online quizzes and the students' academic performance; and (2) to explore students' perception of textbook supplementary online resources to their study.

The aforementioned then raise the research questions of this study:

RQ1. Is there any difference in academic performance between students who have attempted online quizzes and those who have not?

RQ2. How do students perceive the TCW to their learning?

The remainder of the paper proceeds as follows: Section 2 provides a review of the previous research on TCW and online quizzes; Section 3 discusses the research design, participants, and data collection procedures; Section 4 reports the findings of the study; Section 5 presents discussion, and limitation of the study with recommendation for future studies; and Section 6 provides a conclusion of the paper.

2 Literature Review

Benefits of TCW and Online Quizzes

Unlike Learning Management Systems (LMS) of which each lecturer might be entirely responsible for the development of all materials that are posted online and for the administration of the course community, TCW are readily available educational tool and usually does not require extra cost to use and effort to develop. The textbook publisher is responsible for the development of all materials which are standardized and integrated with the textbook for all users. TCW usually offers an assortment of instructional tools that accommodate diverse learning styles. Among the textbook supplementary, online quizzes are a key component. Although students might not be able to use the online quizzes to learn the material, through the online quizzes or exercises provided by the TCW, they are able to test their knowledge of a topic and get immediate feedback [1-4]. Students are allowed to regulate their own pace of learning with less time pressure since they can flexibly choose when and where to sit for the quizzes. Instructor can use the additional tools offered by the TCW to assess how much students are learning. As most of the online quizzes are marked automatically by the system, it releases lecturers' time spent in manually grading the quizzes.

Previous Studies

Research studies on the use of textbooks or their supplementary by college students are limited [5, 6]. In Jonas and Norman's paper regarding the usage behavior of TCW by students, it claims that there are only two empirical studies on TCW in the extant literature, and both of the studies have been conducted almost a decade ago [1]. Jonas and Norman [1] uses the extended Technology Acceptance Model (TAM2) and structural equation modeling to examine characteristics associated with the voluntary usage behavior of TCW by students in entry-level accounting courses. The results indicate that students' perceptions of usefulness, the ability to demonstrate or explain the benefits of usage, and peer usage of the TCW were all positively associated with their actual usage behavior, but a negative relationship between voluntariness and usage. Sellnow, Child, and Ahlfeldt [6] examines student perceptions about the utility of technology supplements that accompanied a public speaking fundamentals textbook. The results indicate that students perceived the supplements to be less useful than they had expected. On the other hand, students perceived the supplements more useful when they were required by the lecturer. Both of the studies mentioned above have not touch the effectiveness of the textbook resources.

In general, additional online material can enhance student performance in the classroom [7]. Potacco, Ramirez-Levine, Chisholm, and Young [3] evaluates the effectiveness of online supplemental mathematics resources in conjunction with traditional teaching methods. The study indicates that the passing rates of students who have supplemented with the online programs were better than the passing rates of unsupplemented students. As an assessment technique, online quiz is being increasingly used in higher education face-to-face (F2F) courses. It is being implemented in an attempt to continuously improve the quality of the student learning experience [8]. Some instructors develop and use online quizzes to encourage students' reading and understanding of textbook and course materials. Although the effectiveness of online quizzes to learning is not promising and the results of studies are mixed [4], Johnson and Kiviniemi [2] indicates that completion of online quizzes relates to both better exam and course performance. Peng [9] also claims that using online quizzes in a F2F course contributes positively to students' learning experiences and outcomes. Accordingly, we posited that:

H1: Student who has attempted the TCW online quizzes performs better than student who has not attempted the TCW online quizzes.

3 Methodology

This study was located in the arena of an undergraduate third year Accounting Information Systems (AIS) course in a private university in Hong Kong.

3.1 Background of the Study

Accounting Information Systems (AIS) course

AIS is a compulsory third year course of the undergraduate degree of Accounting which is a four-year programme. The objective of the course is to help students acquire the necessary knowledge and understanding of contemporary information systems from an accountant's perspective. The duration of the course is fifteen weeks and students were taught in one three-hour class per week. The textbook adopted in the fall

2011 semester was Romney and Steinbart's Accounting Information Systems (12th Edition, 2012). The assessments of the course include class participation (10%), a field visit exercise (10%), a term project (20%), a mid-term test (10%) and a final examination (50%). The mid-term test consists of solely 70 multiple-choice (MC) questions and the final exam only comprised of essay questions covering the content of the whole course.

AIS Textbook Companion Website

Except the "Instructor Resources" part, the textbook companion website is open to public. Learners can attempt the quizzes anytime they want. The online quizzes, so-called "Study Guide", have three kinds of questions including Multiple Choice (MC), True or False (T/F), and Essay Questions. Learners are free to attempt any kind of questions. There is no limit imposed on the time allotted to complete the quizzes and the number of attempts. There are 12 MC questions, 5 T/F questions, and 3 essay questions in each of the twenty-two chapters. Except the essay questions that are not scored by the system, the online quizzes are graded automatically. After clicking the "submit for grading" button, the student can see the summary of results and the correct answer of each question immediately. A screen shot in Fig. 1. illustrates an example of the summary of results of the quiz score.

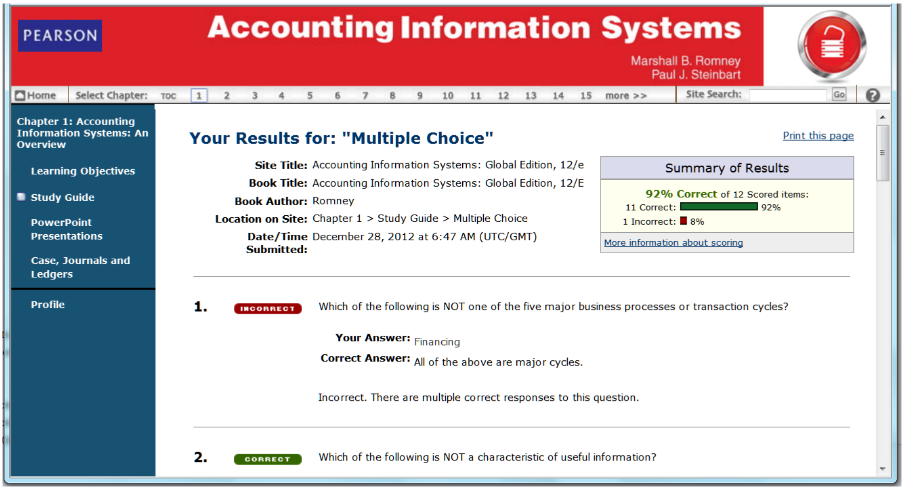

Fig. 1. Summary of Results of Quiz Score

Student can choose to email the quiz result to the lecturer. The email received by the lecturer shows the date and time of report submission, the percentage of the student score, the number of questions correct and incorrect, and which question the student has answered correctly and incorrectly. No information was given on the number of times the students have attempted the quizzes.

3.2 Research Design

Subjects
The participants in this study were 150 undergraduate year three accounting students who enrolled in Accounting Information Systems (AIS) in fall semester of 2011 in a private university in Hong Kong. The 150 students were allocated into five sections. Since all the five sections were taught by the same lecturer, same information was given to all the participants.

Lecturer's Practice
Early in the semester, the lecturer introduced in class the free companion website of the textbook. The lecturer has encouraged the students to attempt the online quizzes and then email the quiz result to the lecturer. Though the students can access the TCW by typing the URL (uniform resource locator) of the website at the Internet browser by themselves, the lecturer has added the URL to the university's LMS. It is because the students were already in the habit of using the university's LMS to access course materials such as course outlines, lecture notes, assessment tasks in the past two years. The lecturer believed linking the TCW to the LMS is important because this encouraged the students to perceive the companion site as an integral part of their learning environment [9]. For the reason of not giving too much pressure to the students, the lecturer has not made the online quizzes a compulsory learning task. However, to motivate the students to do the online quizzes, the lecturer has told the students that doing the online quiz would be counted towards a portion of the class participation mark.

Data Collection Procedure
All the quizzes results emailed to the lecturer have been recorded and associated with the corresponding student's midterm test score and final exam score. As the focus of the study is to explore the relationship between attempting the online quiz and the student academic performance, the number of chapters being attempted, the result of the quiz, the number of attempt for each quiz, and when the quiz was taken have not been measured in the study. SPSS statistical package was used to analyze these quantitative data.

In order to have a better understanding of students' experience and perception about the TCW and online quizzes, 20 students among the subjects were invited to answer a follow-up questionnaire. Students being selected to do the questionnaire include those have highest and lowest scores in the test and the exam respectively. The invitation was sent to these students through email with the questionnaire attached for them to fill in and return. The purpose of the study was clearly stated in the email and students have a free will to participate.

4 Findings

Most of the quizzes results were emailed to the lecturer on the very last day before the MC midterm test, and there was no quiz result being sent to the lecturer after the test.

4.1 Descriptive Statistics of Variables

Amount the 150 students, 49 students have attempted one or more online quizzes and have sent the quiz result to the lecturer. The subjects were divided into two groups: Group 1 (NOT taken online quiz) and Group 2 (Taken online quiz) (see Fig.2).

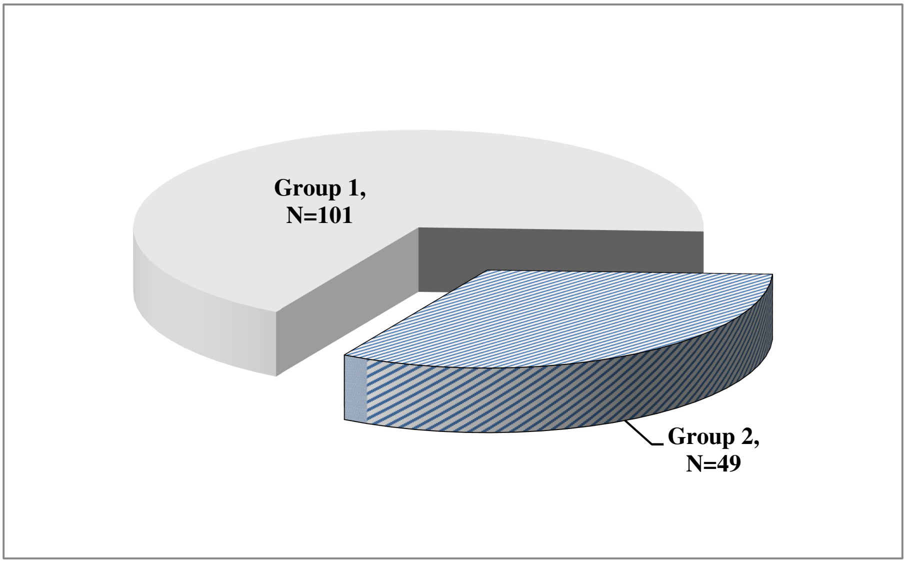

Fig. 2. Distribution of Group 1 and Group 2 subjects

The maximum and minimum scores of the test and the exam of the two groups along with the mean and the standard deviation of the respective scores are summarized in Table 1.

Table 1. Summary of descriptive statistics for the two groups performed in test and exam

	Group	N	Min	Max	Mean	S.D.
Test	1	101	27	56	39.06	5.610
	2	49	27	59	42.71	6.586
Exam	1	101	36	78	53.46	8.214
	2	49	38	75	58.90	8.963

** 1 – Not taken online quiz; 2 – Taken online quiz*

 # Test is score out of 70 marks; Exam is score out of 100 marks

The mean values of test score and standard deviations for Group 1 (Not taken online quiz, N=101) and Group 2 (Taken online quiz, N=49) are 39.06 (5.610) and 42.71 (6.586) respectively. The mean performance of the test in Group 2 was higher than in

Group 1. Moreover, the greater standard deviation of Group 2 than in Group 1, showing a wider spread of scores of the student in Group 2. It might possibly be explained by the fact that individual students gained benefits from the online quiz to a different extent.

The mean values of examination score and standard deviation for Group 1 (Not taken online quiz, N=101) and Group 2 (Taken online quiz, N=49) are 53.46 (8.214) and 58.90 (8.963) respectively. The mean performance of the test in Group 2 was higher than in Group 1. Moreover, the greater standard deviation of Group 2 than in Group 1, showing a wider spread of scores of the student in Group 2. Individual students might gain benefits from the online quiz to a different extent.

4.2 Mean Test

To analyze if there were any significant mean differences between the groups, independent-sample t-test was conducted. The t-test results showed that there were significant differences in the mean values between the groups (see Table 2 and Fig. 3).

Table 2. Independent t-test results for the two groups in the test and the exam

	Group	N	Mean	Mean Difference (at 95% confidence level)	t-value (sig.)
Test	1	101	39.06	3.655+/-2.045	3.532 ($p<0.001$)
	2	49	42.71		
Exam	1	101	53.46	5.443+/-2.913	3.693 ($p<0.001$)
	2	49	58.90		

* *1 – Not taken online quiz; 2 – Taken online quiz*

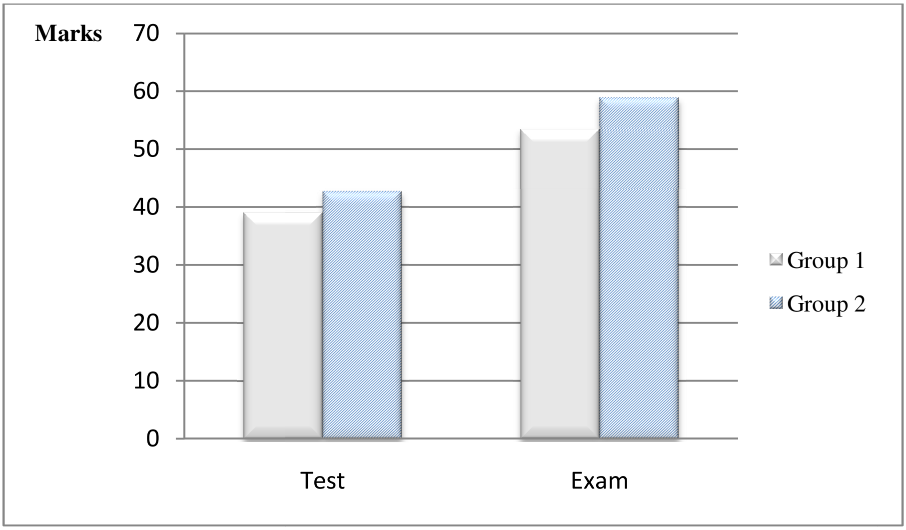

Fig. 3. Test and exam mean scores of Group 1 and Group 2

For the test scores, the mean difference between Group 1 and Group 2 were 3.655 +/- 2.045 (sig. at $p<0.05$). It showed that Group 2 had a significant higher means than Group 1. In the other words, students who took the online quiz outperformed those who did not in the test.

For the exam scores, the mean difference between Group 1 and Group 2 were 5.443 +/- 2.913 (sig. at $p<0.05$). It showed that Group 2 had a significant higher means than Group 1. In the other words, students who took the online quiz outperformed those who did not in the exam.

Overall, hypothesis (H1) was supported.

4.3 Post-hoc Analysis

Amount the 20 students being invited to do the follow-up questionnaire, 10 of them have returned the questionnaire (see Table 3). Nine respondents indicated that their awareness of the TCW of AIS course come from the lecturer, only one respondent discovered the online supplementary by self. Also, only three of them knew the existence of this kind of website before studying AIS. All of them, including the two who have not emailed any online quiz result to the lecturer, claimed that they have visited the TCW of AIS and have tried the online quiz. Six respondents, including the two who have not emailed quiz result to the lecturer, reflected that they have not visited TCW of other courses. And none of the respondents disagreed the TCW of AIS is user-friendly.

Table 3. Information of students being invited to do the questionnaire

Exam Score	**High**					**Low**				
Student	*S1*	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*	*S8*	*S9*	*S10*
Test *(out of 70)*	48	42	39	52	40	49	41	41	36	28
Exam *(out of 100)*	78	76	75	73	62	45	45	43	41	40
Online quiz			✓	✓	✓	✓	✓	✓		
Return questionnaire	✓	✓	✓	✓	✓	✓	✓			
Test Score	**High**					**Low**				
Student	*S11*	*S12*	*S13*	*S14*	*S15*	*S16*	*S17*	*S18*	*S19*	*S20*
Test *(out of 70)*	59	56	55	52	36	29	29	28	27	27
Exam *(out of 100)*	69	59	64	63	52	45	52	40	60	65
Online quiz	✓		✓		✓		✓		✓	
Return questionnaire	✓				✓		✓			

In general, students' perception about the TCW is positive. When asking whether TCW is useful for their learning, only one respondent claimed that TCW is not very useful, one of them perceived TCW is very useful, and the rest reflected that TCW is useful (6) or maybe useful (2) for learning. When the question is specific on the online quiz component of TCW, all of them responded that the online quizzes are useful for their learning of AIS. A majority (8) of them would not do the online quiz if the lecturer had not mentioned about it. Seven of them would repeat the same quiz until they got all the answers correct. Except the one who has not emailed any quiz result to the lecturer, the rest believed that email quiz results to the lecturer could gain bonus marks.

Only one respondent disagreed that doing the online quiz increases their understanding of AIS. Nine respondents leaned towards strongly agree that they would do the online quiz if the lecturer says it is useful for their study. There are six respondents claimed that they have heard their classmates talking about the TCW of AIS, and seven respondents agreed that they would do the online quiz if they know their schoolmates have done it. There are two respondents stated that they did the online quiz because their schoolmates suggested them to do so. Moreover, nine of them would do the online quiz if the lecturer gives them bonus marks.

Eight respondents agreed that doing online quiz helps preparing the midterm test, but only four of them agreed that doing online quiz helps preparing the final exam. Only three of them agree that they would do the online quiz if the midterm test does not contain MC questions. All the ten respondents agreed (among them, 7 strongly agreed) that they would do the online quiz if the final exam contains MC questions.

Among the ten respondents, six of them disagreed making the online quiz a compulsory task of the course. The only respondent who agreed making the online quiz compulsory was the only one who tended strongly agreed that doing the online quiz is time consuming. This distinctive student has not email any quiz result to the lecturer, but whose exam score is the highest in the semester.

5 Discussion

The finding of this study shows the potential benefits of the textbook supplement but the usage is low. Evidence indicates that students who have attempted the online quizzes gain significant higher marks in both MC midterm test ($p<0.001$) and essay mode final exam ($p<0.001$). Although the lecturer has encouraged the students to attempt the online quizzes with bonus marks, there was only about one-third of students take part in this optional task. Students may basically view the cost of studying in terms of opportunity costs. Since the incentive is so little (only a portion of the 10% of the final grade), students might consider not worthwhile to put effort on it. Sometimes, even the students may be aware of the potential benefits of extra learning activities, they are often reluctant to engage with them because of the required time commitment [10]. In addition, it is possible that some students may have a goal of simply passing the course, and perhaps they believed that this goal can be achieved without doing the online quizzes.

Since the positive impact of the textbook online quizzes on student performance has been demonstrated, it is essential to attract all the students to utilize this tool. In order to encourage students to do the online quizzes, instructors might consider increasing the proportion of the course grade allocated to the TCW online quizzes. It is understandable that today's students are facing a lot of temptation and doing course work is not the most entertaining activity to them. Students might take it more seriously if the rate of the quizzes is higher. Moreover, students often leave their school works until the last minute. It is suggested to motivate students to study on a more regular basis by spreading the required online quizzes evenly during the semester. Preventing students from cramming for multiple quizzes closer to exam time is beneficial to the students. Through continual self-evaluation, students can spot problems or misinterpretations earlier and take corrective action sooner. It is anticipated that student's more consistent effort would consequently lead to greater learning. Alternatively the TCW quizzes can be assigned to the students as pre-class reading quizzes which might be more effective to the understanding of the course material [2].

Discussion of the Follow-up Analysis

As indicated in the post-hoc analysis, it seems that students might not correlate the value of doing MC quizzes with answering essay type questions. Students' behavior is influenced by their perception of what will work for them [5]. It is relatively easier for the student to perceive the usefulness of the online MC quizzes to the MC midterm test but not the essay type questions. This could probably be the reason why the students stop doing the online quiz after the midterm test. It is necessary for the lecturer to take a step to motivate or provide incentive, encouragement for the student to use this online tool.

Like previous study indicates that students expressed frustration at being forced to do the assignments [5], a majority of the respondents in this study would not like to make the online quizzes compulsory. Instructors might want to give autonomy to university students responsible for their learning as they should be mature enough to do so, but studies indicate that college students still need guidance and motivation in their learning [2, 5]. In the classroom setting, students will be more likely to use the TCW if they perceive that they are required to do so by the lecturer [1]. For the benefit of the student, it is suggested to decrease perception of voluntariness by making the online quizzes as a required task of the course. Also it is necessary to balance student's workload by taking out or reducing other required tasks.

Student adoption towards educational technology is influenced by a number of factors [11]. The result of the follow-up questionnaire reflects that the students' behavior of attempting the online quiz would be influenced by both their peers and the lecturer. Most of the students learnt about the TCW from the lecturer and they would do the online quizzes if the lecturer says it is useful for their study. Therefore, in addition to introducing the TCW to the students, instructors need to explore the utilization of the TCW resources and provide empirical evidence of the positive impact of the textbook supplementary to their students who need to be encouraged to use the resources available on the TCW [1].

Limitations and Future Studies

There are several limitations acknowledged in this study and each limitation offers an opportunity for future research. This was a quasi-experiment that student subjects were not randomly assigned to control or to experimental groups. Rather, they were voluntary to choose to act. Further studies should better examine their performance before the study to make sure that there were no significant differences among those who took or who did not take the online quiz. This study only considered two variables: (1) NOT taken online quiz, and (2) Taken online quiz. Future studies might include the number of quizzes attempted as a variable and examine if student attempts more quizzes would do better in the test and the final exam. Future studies might also explore the effect of quiz timing to student performance, and whether spread the online quizzes evenly or allow the students to do the quizzes at their own pace make a difference in their performance. Prior studies suggested that individual differences, such as, cognitive learning styles [12-14], would affect how student subjects learned and their attitudes towards online learning. Future studies might also explore individual characteristics in affecting learning performance.

The findings of this study may not generalize to other student, course and university settings. Since using the existing resources of TCW might entail limited effort, lecturers from other courses could try integrating the resources into the curriculum in different ways to see which is more effective. Since this study was conducted specifically in an AIS course, the result of the study may or may not apply to other courses and other universities. Similar research might be situated in the context of other courses and at other institutes. Future studies might also examine the effectiveness of different components of TCW, and explore the faculty's perception of these online resources as well.

Another limitation on our findings was the relative lack of detail provided by the survey instrument. The data for the follow-up analysis were collected via a closed-ended questionnaire and the number of respondent was small. In order to have an in-depth investigation of the student experience and perception of the TCW, future research might use focus groups and open-ended survey questions where respondents can give more detail opinions.

6 Conclusion

Probably the most important finding of this study is the correlation between doing textbook online quizzes and student's academic performance in AIS course. This study provides valuable evidence for the real educational value of the TCW online quizzes to student learning. As a practical issue, the encouraging impact of TCW on student performance and students' positive attitude toward TCW should encourage lecturers to make use of the already developed and paid online resource. Since the resources already exist, lecturers should consider what works and what does not in specific contexts. Although the limited scales of this study do not allow the research findings to be generalized, it was expected to arouse the interest of academic staff and researchers who do concern themselves with student's effective learning.

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Altering Study Habits with Email Reminders

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Abstract. Students were motivated to acquire a new study habit of reviewing within 24 hours of the weekly lecture. We sent email reminders to students during the first term to reinforce this habit. At the end of the full year course, students reported whether they have acquired and maintained the new habit during the second term without the reminder support. While there are more failures than successes in their attempts to acquire the new habit, we found evidence for a correlation of the email reminders and the successful habit formation. We also found the new study habit to have a positive effect on student performance. We conclude that the effort to improve the study habits of university students even in their senior years has paid off. Some students also reported that their reviewing is not useful or only somewhat useful in their learning experience. It is an indicator that assistance may be in order for students to overcome challenges in their study.

Keywords: study habits, habit formation, student performance, email reminders, blended learning.

1 Introduction

A habit is an activity that we repeated. Good habits are important because of their accumulating effects day after day. There is evidence that effective study habits contribute to good student performance [1, 2, 3]. Survey of Study Habits and Attitudes (SSHA) [4] and Learning and Study Strategies Inventory (LASSI) [5] are two approaches to break down study habits into components such as attitudes, time management, study skills, and so on. Scores in various components have been used to predict academic performance with some success [4, 6].

In the role as lecturers rather than admission officers, we are more interested in improving rather than predicting student performance. An especially bad study habit common among students is to cram too much learning just before a test or an examination. To combat this bad habit, we picked a suggestion from the study skills package provided by the Counseling Services of the University of Waterloo [7] that is for students to review the newly taught materials within 24 hours after each lecture.

We conducted our research in a full-year course. We sent email reminders to students to reinforce this new habit during the first term. We did not send any reminders in the second term in order to see if the reminders from the first term have lasting effects. At the end of the course, students reported whether they had acquired and maintained the study habit. Though three out of four students having received the

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 190–198, 2013.

reminders did not acquire and keep the habit, the corresponding rate for students not receiving any reminders was worse at seven out of eight. The evidence is statistically significant that email reminders help students to acquire new study habits.

We also learned that the new study habit has helped students to perform better though the evidence is not as strong as our first finding. Our other results include:

a) Students paying attention for at least 80% during the lecture improves more than those who don't.
b) Students prefer emails over WhatsApp and FaceBook as the medium of the reminders.
c) Half of the students rate their reviewing as *sometimes useful* in their learning.

Section 2 of the paper describes the basic mechanism of habit formation. Section 3 describes the setting of our study. Section 4 describes our direct observations. Section 5 concludes with our interpretation of the results and future work

2 Habit Formation Literature

Research work on the impacts of study habits can readily be found in education literature. But for the work on habit formation, we need to borrow from the field of psychology. Each repetition gradually increases the habit strength until it reaches a plateau [8, 9]. Lally et al. investigated habit formation on 96 participants over the course of twelve weeks. The participants each chose a healthy behavior which he or she wanted to turn into a habit [10]. The new habit had to be performed in a daily recurring context. Examples were "eating a piece of fruit with lunch", "drinking a bottle of water at lunch" and "running for 15 minutes before dinner". A remuneration of £30 was paid to each participant whether or not the chosen habit was formed by the end of the experiment. The participants were expected to report daily online if the activity was actually performed. In case they had forgotten to report on one day, they had up to 3 days to report previous activities. Twelve participants omitted too many reports and their results were ignored. About half of the remaining participants successfully developed the habit. The average time to reach the plateau of a daily habit was 66 days and the shortest was 18 days. They found that exercising habits took longer to form than eating and drinking habits. It agrees with prior work which suggests that the time to form a habit increases with the complexity of the behavior [11].

It is generally accepted that previously acquired habits are cued by context. Therefore when we design ways to impart new study habits on students, care should be given to the choice of cues. But human beings are goal-driven. When a habit is being formed, habits would interact with goals to guide the choice of responses [12].

3 Study Setting

The study was conducted with students from a full-year course in software engineering and project management. The students were enrolled in one of the undergraduate programs in computing, electronic and computer engineering at the third or fourth year level. Students vary considerably in their abilities and interests, for example software versus hardware. The course has a 2-hour lecture and a 2-hour tutorial weekly. All 150 students attended the same lecture but were divided into four tutorials to work on exercises and group projects.

In the first lecture, the lecturer talked to students about the benefits of having effective study habits. A few good habits were discussed briefly. One of which is to review within 24 hours of the lecture for improved retention and understanding. After the motivational talk, students were given a questionnaire asking if they already had the habit of reviewing taught materials within 24 hours of the lecture. Those who answered "no" were given the option to receive a weekly email reminder to acquire this new habit.

In the second term, the lecturer stopped sending email reminders. The tutorials took place one or two days after the lecture. The tutor asked participants individually in the weekly tutorial whether they had reviewed within 24 hours after the lecture. Even if a student did not review this week, the asking by the tutor may serve as a long-range reminder for the student to review shortly after the next lecture.

An estimate of 125 students attended the last lecture of the course in the second term. We gave out another anonymous questionnaire to students with the following questions.

1. Did you receive email reminders?
2. What are your preferred means to receive reminders?
3. Did you acquire the habits to review after the lecture?
4. What were your scores in the two term tests?
5. How much do you think the review has helped you in understanding and memorizing the materials?
6. Are you fully concentrated for at least 80% of the lecture?

4 Observations

Out of the 125 students attending the last lecture, 105 filled out the final questionnaire. The questionnaire concerns a very specific study habit of "reviewing within 24 hours after lecture". Students who did not have the habit may still studied hard regularly except over 24 hours after the lecture.

4.1 Effectiveness of Email Reminders

Our null hypothesis is that the proportion of students having the habit to review within 24 hours from the lecture is independent of the email reminders. Two students gave no answers. Responses are shown in Table 1 and Figure 1. For students not receiving reminders, the ratio of students with and without the review habit is 6:52. For students receiving reminders, the ratio is much higher at 10:35. The p-value is 0.004133 smaller than the conventionally accepted significance level of 0.05. We can comfortably reject the null hypothesis to conclude that the proportion of students with the newly acquired study habit is associated with their receipt of email reminders.

Table 1. Email Reminders and Establishing Study Habits

	Review within 24 hours	Others
Received reminders	10	35
Don't receive reminders	6	52

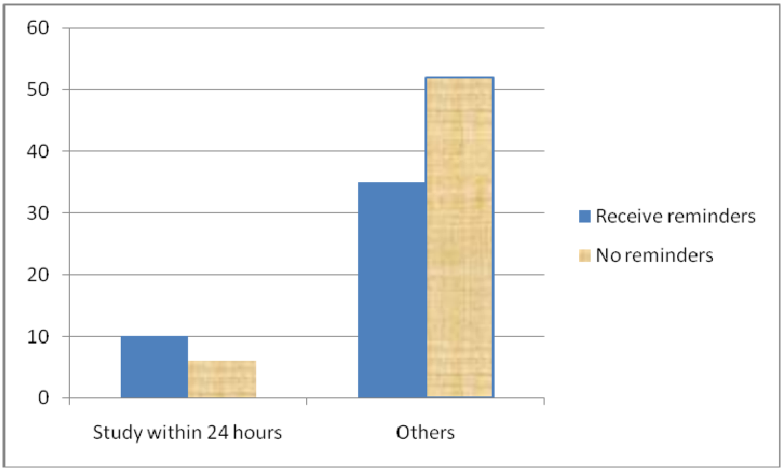

Fig. 1. Reminders and study habit

4.2 Benefits of Reviewing within 24 Hours after Lecture

Student abilities in this course varied considerably. The benefits of a newly acquired study habit may not be enough to compensate for the weaker background of some students. It is more meaningful to compare the scores of two term tests as shown on Table 2. A higher score in the second test may suggest that the student has improved with the help of the new study habit. The tests took place on November 13th and February 5th. The perfect score was 100. Student reported their scores in 20-mark brackets of 0-20, 21-40, 41-60, 61-80 and 81-100.

Table 2. Reviewing within 24 hours and improved test scores

	Performance		
	Worsen	**Same**	**Improved**
Review within 24 hours	0.00	0.67	0.33
Others	0.16	0.46	0.38

If a habit is beneficial, we expect to see students appearing in the *improved* column but not in the *worsen* column. The percentage of improved students is 5% better for the students WITHOUT the habit (0.38 versus 0.33). On the other hand, the percentage of worsened students is 16% better for the students WITH the habit (0.0 versus 0.16). The result is less clear-cut than before though reviewing within 24 hours still comes out a little ahead.

4.3 Paying Attention in Class

We sometimes spotted our students not paying attention in lecture. The distraction may be texting on a mobile device or working on an assignment for another course. Only 26 of the 105 students reported that they paid full attention for at least 80% of the time in lecture. The number of attentive students seems low. It reflects the reality that the young institution in which the research was conducted was not attracting the strongest and most motivated students in the region. We would argue that we are the kind of institutions that benefit the most from students' improved study habits. Table 3 shows that paying attention in class pays off in better performance which again is measured by the delta in two test scores.

Table 3. Paying attention in lecture and improved test scores

	Performance		
	Worsen	**Same**	**Improved**
Paying attention 80% of the time	0.08	0.52	0.40
Others	0.15	0.48	0.37

4.4 Preferred Reminder Media and Study Aids

Students were asked which media they prefer to receive study reminders from. With multiple selections allowed, 60% picked email, 30% WhatsApp and 27% for Facebook and 3% for Line as shown in Figure 2.

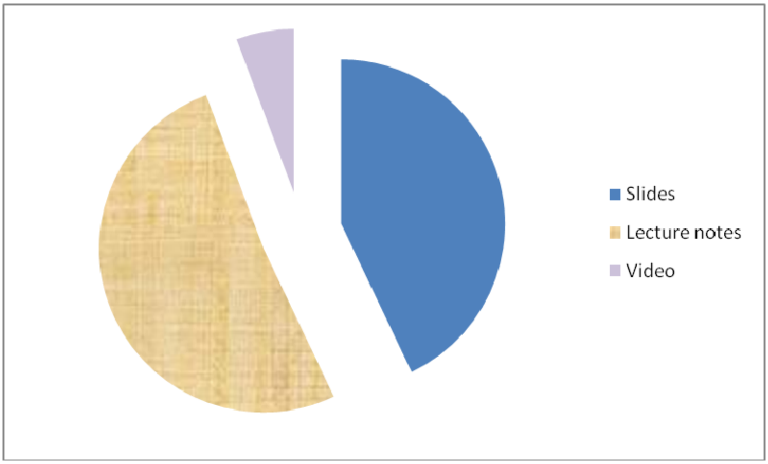

Fig. 2. Preferred study aids

In the first ten weeks in the second term, the 105 students together reportedly studied the lecture notes for 677 times, the lecture slides 566 times and the video clips on YouTube 75 times. Lecture notes were provided in printed copies and softcopies. The lecturer recorded lectures with the voice and slides for posting on YouTube as unlisted video clips which can be accessed through links on the course website.

4.5 Perceived Usefulness of Reviewing

Students were asked if they think reviewing has helped them to better understand and memorize the taught materials. The answer can be *not useful*, *sometimes useful*, *useful* or *very useful*. The result is shown in Figure 3. We originally expected most students would find their reviewing to be *useful* or *very useful* for their understanding and memorization. But half of the students selected the less desirable answer of *sometimes useful*. An alarming 9.5% of students even found reviewing *not useful*.

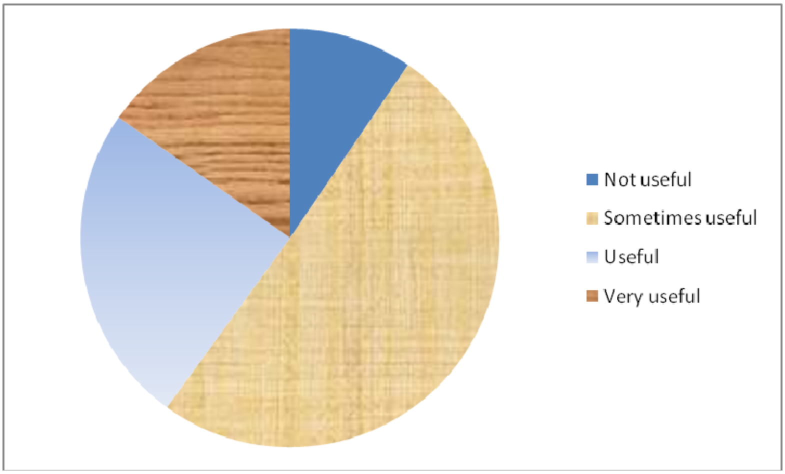

Fig. 3. Perceived Usefulness of Reviewing

5 Conclusions

5.1 Summary

When higher education was the privilege of the elite, we could assume that most students had the talent and study habits to take full advantage of their education. As higher education becomes more accessible, we find some students lack the effective study habits to handle the challenging materials. Posting study habit self-help guides on university websites is not very effective when many students either did not know of their existence. Even if they do, it is questionable that they can acquire the good habits without additional support. Briefing new students in a short seminar is only marginally better. Weaker students spent over 12 years to acquire and practice poor study habits. They need more support to change poor study habits than a short document or seminar can afford. Our preliminary work demonstrated that some students can acquire a good study habit cost-effectively by a weekly reminder over a study term.

How do we interpret the fact that 60% of the students considered reviewing *not useful* or *somewhat useful*? One explanation is that students had ignored our notion of usefulness being defined on understanding and memorization. They could have reverted to their own definition that usefulness implies the studied materials actually appear in a test or an examination for them to get a higher score. Another explanation is that their weak English is preventing them from fully understanding the lectures and detailed lecture notes provided. Studying twice or thrice of materials written in a foreign language that they are not good at may not benefit them as much as they would like. The solution to this later problem requires the mastery of the instructional language which is English in this case for our Chinese-speaking students.

5.2 Future Work

A potential problem with this research is the self-reporting data collection. It is easy for our participants to have forgotten what happened a few weeks ago. Another problem is the lack of precision in the definition of some actions. Is the duration of five minutes long enough for the review after the lecture? We need more precision in our instructions to students on how best to review and to keep a record of their study duration. A third problem is that the sending of reminder email messages was done manually. When we were busy with our other chores, we did not always send out the reminders consistently at the same time of the day.

A functional software application can address some of the above problems. The email reminders for a student should be sent automatically and consistently at a time chosen by individual students as their best time to study. By timing the reminder just before the new desired habit, we are using the reminder, time and place as a cue for the new habit. Figure 4 shows Charles Duhigg's habit loop [13] with a minor difference in terminology. Duhigg's triggers or routines are called habits. We will try to design our software to make the rewards timely and obvious to students.

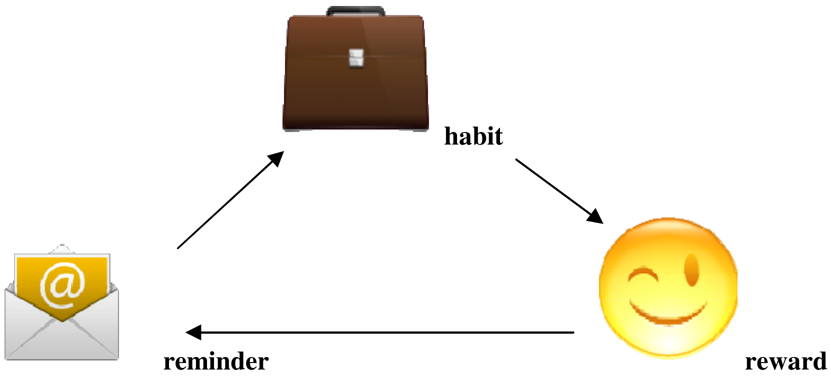

Fig. 4. Habit loop adapted from [13]

Inside an email reminder, there should be a link for students to go to a webpage to report the time and duration of the review every week while they still remember. We can even ask students a few randomly selected questions before and after their review. This will be our more objective measurement of the usefulness of the review than the self-reporting approach. It is up to us to limit our questions to multiple-choice and fill-in-the-blank to facilitate fast automatic marking.

Once we have implemented the automatic data collection, we lose the anonymity of using paper questionnaire. Even if we ignore the student identity in our software design, suspicious students may not trust us entirely. But we do not think the level of distrust is too bad. The higher accuracy in collected data is worth the frequent and automated tracking of students' study habits.

Finally, there are other study habits we may try to help students to acquire. In addition to the "review within 24-hour" habit, we can add the "review weekly" habit for students to better deal with the so-called curve of forgetting [14]. The University of Waterloo and Maryland Community College endorse both the daily and weekly study habits for their students [7, 15].

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Interactive Sensory Program for Affective Learning (InSPAL): An Innovative Learning Program Combining Interactive Media and Virtual Reality for Severely Intellectually Disabled Students

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Abstract. While special educational and training programs have been developed specifically for severely intellectually disabled (SID) students; little research has been carried out that employs the latest advances in virtual reality (VR) technology and 3D motion recognition for this population of students. In this study we focus on the development of a unique psycho-educational program called Interactive Sensory Program for Affective Learning (InSPAL) that exploits natural interface and virtual reality technologies together with pedagogically designed VR learning scenarios to enhance the pre-learning skills of SID students. The InSPAL program offers to SID students an environment in which to actively interact with the virtual learning scenarios, communicate in an alternative way, and develop a sense of mastery enhancing their learning potential. This paper will highlight the learning objectives, the instructional design and training flow for two of the learning domains of the InSPAL program. Our preliminary observations show that the SID students demonstrated an ability to interact with the virtual learning scenarios and many were able to communicate by raising their hands post training.

Keywords: Interactive media, virtual reality, severely intellectually disabled, psycho-educational learning scenarios.

1 Introduction

The application of Virtual Reality in education is beginning to gain attention in some General Education environments [1], but little work has been carried out in Special Education Settings, especially those serving Severe Intellectual Disabilities (SID) students with significant learning challenges. In response to this, City University of Hong Kong (CityU) has undertaken the research and development of an Interactive Sensory Learning Program called InSPAL for the severely intellectually disabled (SID) students, who are having cognitive deficiencies and other sensory-motor handicaps, and thus need more help and attention in overcoming their learning

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difficulties. Through combining and integrating interactive media, 3D motion capture, and virtual reality technologies with the principles of art therapy and relevant pedagogical techniques, InSPAL aims to strengthen the SID students' pre-learning abilities, promote their self-awareness, decrease behavioral interferences with learning as well as social interaction, enhance their communication and thus promote their quality of life.

Individuals with severe intellectual disabilities (SID), otherwise known as severe mental retardation (SMR) constitutes an intellectual impairment IQ range between 20 to 35; with marked limitations in cognition, self-care, communication, and social/interpersonal skills [2].

One primary aspect that impedes the learning for SID students is the lack of ability for many to communicate and interact effectively with others, as well as to focus and engage in the educational activity for an extended period of time. The current use of Speech, Occupational, and Physical Therapy Programs are well recognized as a viable means to improve the overall functioning of SID students. Alternative programs in education and training are being developed and carried out for children with mild to moderate disabilities, virtual reality (VR) being one of them. The use of virtual reality and interactive media can be an authentic tool to stimulate appropriate affect (e.g. curiosity, motivation, attention) for learning and to integrate and bridge internal and external realities [3]. The application of VR to children with disabilities helps to improve social-emotional capability [4] as well as develop a sense of self-control over multisensory stimulation and mastery [3], [8]. VR offers a learning mode that is experientially based enabling the learner to be immersed in the virtual world and can require less mediation from the teacher/facilitator [5]. Our InSPAL program offers to SID students a novel learning environment in which to actively interact with the virtual scenarios, communicate in an alternative way, and develop a sense of mastery and self-esteem, enhancing their learning potential.

2 Learning Objectives and InSPAL Learning Scenarios Design for SID Students

In this project, the scope of the key learning objectives for SID students are as follows: 1) To increase attention span 2) To induce curiosity 3) To learn to differentiate 4) To increase articulation/verbal expression 5) To increase body coordination and visual tracking. Based upon these learning objectives, eight learning scenarios have been developed within the framework of four learning domains 1) Safety awareness 2) Cause and effect 3) Balance 4) Sensational experience. Due to the limitation of space, in this paper, we will focus on the research and design of the learning scenarios and psycho-education sessions with the students for two of the learning domains, namely Safety Awareness Domain and the Cause and Effect Domain.

2.1 InSPAL Psycho-Education Session Design and Programme Schedule

We are currently conducting the main core of the INSPAL learning programme for SID students in collaboration with The Mental Health Association of Hong Kong – Cornwall School, and have developed a training protocol for the InSPAL classes.

The psycho-educational sessions involve 8 classes of SID students scheduled in an 18 months period, which include 4 sub-periods. Two classes would take part in each sub-period which approximately last for 5 months. In each sub-period, a class would go through a preparation programme which allows the SID students to accustom to wearing the 3D viewing glasses, and then work through 2 learning domains. Each learning domain last for 2 months and each class had 2 training sessions each week on the average, making it a total of 16 sessions for each domain, and a total of 32 psycho-educational training sessions.

Working in close collaboration with teachers and staff of the collaborating school, we have been able to fine-tune the InSPAL training protocol based upon our continued exposure to the varying levels of cognitive and physical functioning of the students, and specified behavioral objectives that we have identified whilst working with them. The flow of Psycho-education sessions for the Safety Awareness Domain is presented below.

2.2 Learning Domain 1: Safety Awareness Domain

Most SID students are not aware of the importance of safety, which impedes their overall functioning and ability to take some control of their environment and make healthy choices. Safety awareness is a key concept needed for SID students in order for them to be able to navigate safely at school and at home. Through training, students can learn to decipher between safe and unsafe items and what to touch and not touch. InSPAL interactive scenarios allow students to learn about safety standards within the safety of the VR space. The benefit of offering a VR space is that if students make a mistake and touch an unsafe item, they will not 'get hurt'. The InSPAL learning environment enables students to learn the concept of safety in a 'safe environment'.

Learning Scenario 1: Safety at School. The learning objectives for this learning scenario are as follows: 1) To learn to differentiate between safe and unsafe items within the school environment. 2) To make decisions as to what is safe to touch and what is not safe to touch. 3) To enhance the adaption of appropriate behaviour within the environment.

In the *Safety at School* Scenario, students will be immersed in a school virtual space consisting of a variety of safe and unsafe items in their view. Such items will range from plants to sharp items such as scissors/ or slippery conditions. With the support of the teacher/facilitator, students will learn to distinguish between safe/unsafe items and select only to touch safe items using simple hand gestures. Figure 1 shows a sample screen of the *Safety at School* virtual space.

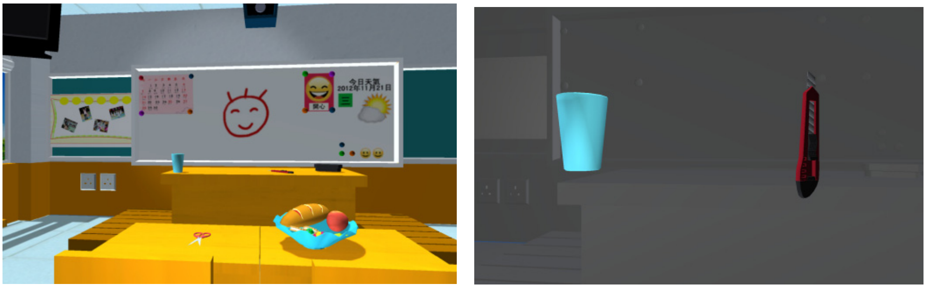

Fig. 1. Safety at School Learning Scenario. (Left: a classroom scene containing safe and unsafe objects; Right: One safe and one unsafe object were highlighted for the student to choose)

Learning Scenario 2: Safety at Home. The learning objectives for this learning scenario are the same as those for the learning scenario Safety at School except it is designed for the home environment.

In the Safety at Home Scenario, students will be immersed in a home virtual space consisting of a variety of safe and unsafe items in their view. Such items will range from a teddy bear sitting on a sofa/ or pillows to a gas stove with lit fire/ or electricity coming out of the socket to a bottle of pills. With the support of the teacher/facilitator, students will learn to distinguish between safe/unsafe items and select only to touch safe items using simple hand gestures.

Psycho-education Sessions for the Safety Awareness Domain. The flow of InSPAL training session involved working with each student individually. Referring to Figure 2,

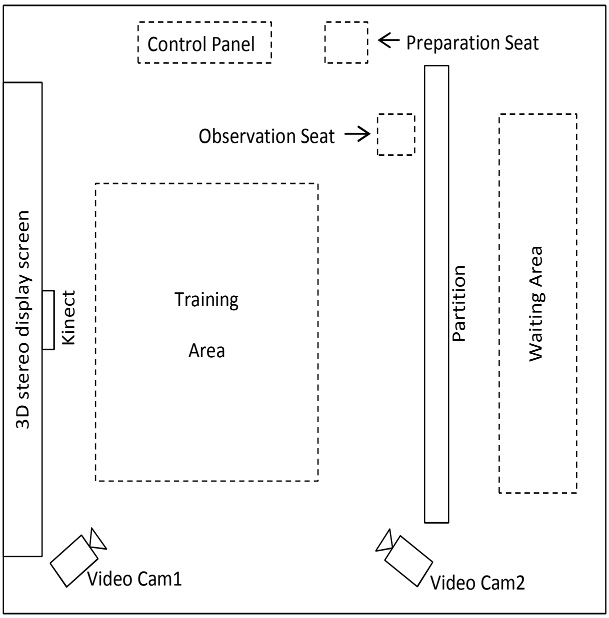

Fig. 2. InSPAL Scenario Training Environment

each student enters the InSPAL playing area (wearing the 3D glasses) and is first given a demonstration by the trainer of the interaction activity with the virtual 3D classroom scenario. The virtual classroom scene zooms into a pair of items, one which is a safe item and the other unsafe (see Figure 1). The trainer "points" only to the safe item, while at the same time verbally stating that this item is safe. This is then repeated for other pairs of safe and unsafe items. After all pairs of items have been shown, the demonstration is completed. After the demonstration, the student is given an opportunity and encouraged to select each pair of safe items in the classroom setting as s/he has seen in the demonstration. If the student cannot select on his/her own, the trainer supports the student to select the safe item using a hand on hand support technique. Each training session with the student consists of 2 demonstrations by the trainer and 2 practice sessions for the student.

2.3 Learning Domain 2: Cause and Effect Domain

Another key concept needed for learning is the concept of Cause and Effect. A majority of SID students are passive and wait for their teachers and caregivers to carry out tasks and meet their needs. For example, "Raising my hand will have the effect of the teacher knowing that I need to go to the toilet." By strengthening this concept in students, they can begin to meet their own needs, learn that there is a consequence and increase their ability to take some control of themselves within their environment. The InSPAL learning environment enables students to experience and practice this concept of cause and effect in 3D space, and once acquired, this skill can be transferred into the classroom setting and home environment.

Learning Scenario 3: Touch to Change. The learning objectives for this learning scenario are as follows: 1) To experience seeing in 3D space the effect of touching something (cause and effect). 2) To practice controlling their body and satisfying their needs. 3) To increase articulation/verbal expression.

The consultant/trainer worked to train the SID students to raise their hands to 'touch' the virtual bubbles (cause); the effect of touching the bubble is that the virtual bubble will burst. After touching and bursting five bubbles, a big beautiful happy face

Fig. 3. The 'Touch to Change' virtual learning scenario

would emerge on the screen, along with happy music, giving positive feedback to the student for their success and experiencing the cause and effect process. Figure 3 shows a sample screen of the Touch to Change virtual 3D scene.

Learning Scenario 4: Coloured Balloon Sculpture. This was much like learning Scenario 3 except that it entailed a more complex visual outcome, further engaging the students into the cause and effect experience. The flow of the training followed the same as the above, except in this scenario the students were trained to raise their hands touch the virtual balloons and could experience the effect of touching the balloon in that it would burst, transforming into an object/ or animal (ie) teddy bear, flow in mid-air and then fall to the ground, making it a sensational outcome.

Psycho-Education Sessions for the Cause and Effect Learning Domain. The flow of training session involves working with each student individually. Again referring to Figure 2, each student enters the InSPAL playing area (wearing 3D glasses) and is given a demonstration by the trainer. After the demonstration, the student is given an opportunity and encouraged to raise his/her hand to reach the bubbles. If needed, the trainer would provide a hand on hand technique (see Figure 3) to train the student to raise his/her hand until all 5 bubbles were popped and the 'happy face' appeared. This procedure would continue for 3 rounds. Each time the student came to engage in the Touch-to-Change Scenario, they were encouraged to reach for the bubbles independently, giving them autonomy in the cause and effect experience.

3 The InSPAL Learning Environment

An InSPAL classroom was designed and installed in The Mental Health Association of Hong Kong – Cornwall School (MHAHK) to support the interactive sensory programme with the provision of different modalities of interactive multimedia and 3D stereo display, including hardware, software, installation materials, sensor and interactive device which were shown in figure 5.

3.1 The Hardware and Software

The hardware – computing equipment enabled the implementation of the graphics rendering programme and the processing of input data from the sensor and interactive device. The input data is provided in the form of body joint positions (i.e. the head, hands and upper body movements) in 3D space, i.e. the actual environment. To achieve real time interactions, the commonly available motion sensor Kinect was used as the main sensor and interactive device.

The software includes the development of robust and custom-made algorithms to capture and recognize the body gestures (e.g. raising hand, pointing and weight shifting actions) of SID students in order to enable them to take control of the interactions with the virtual environment in the learning scenarios.

3.2 3D Stereo Display

To provide a vivid virtual environment, the 3D stereo system played an essential role in the InSPAL learning environment design. The system consisted of 3D stereo projection facility, silver display screen and 3D viewing glasses. The system applied both circular polarization filters and lens to enable the display of 3D effects in abnormal viewing positions, including head titling which is commonly seen in the SID students due to their physical limitation. A 3D silver display screen was installed to compensate the reduction of illumination caused by polarization filters and provide a bright and clear 3D display. The polarized 3D viewing glasses were designed and configured that would be suitable and comfortable to be worn by the SID students.

3.3 Working Environment

For the working environment setting, a partition screen was set up to separate out a waiting area for the students waiting to work with the 3D learning scenarios from those who were, at the time, working with the learning scenarios. The partition serves to reduce the possibility of the students who were working with the 3D scenarios, whose attention might be distracted by those waiting in the same room. The resulting working environment as shown in Figure 4 had been proven effective in the training sessions.

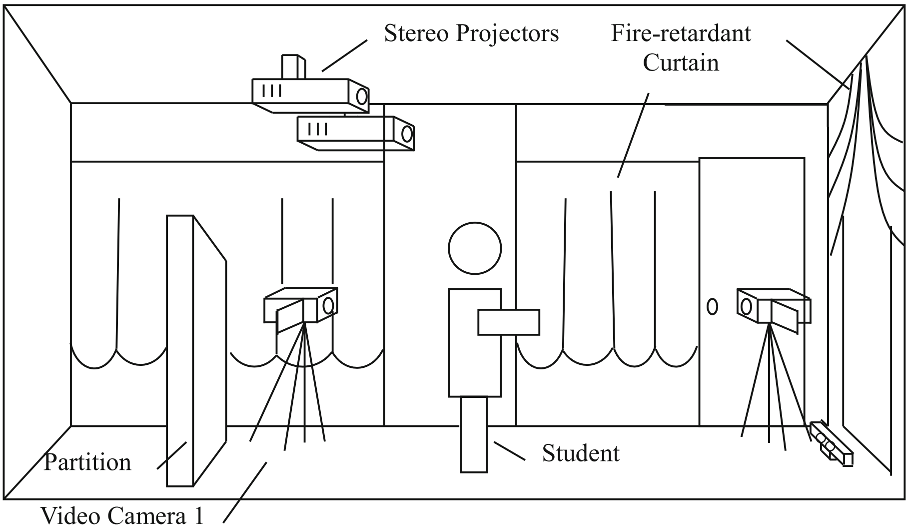

Fig. 4. A schematic of the InSPAL Learning Environment

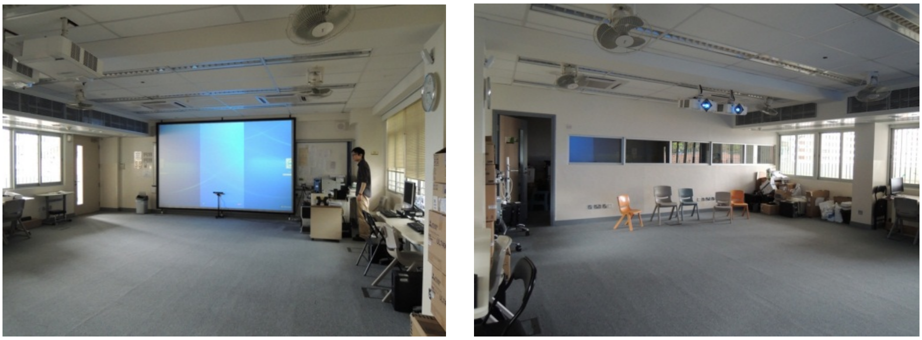

Fig. 5. The InSPAL Classroom

4 Conclusion

We are currently in the process of conducting the year-long InSPAL training programme. The preliminary observations are that most SID students have had a positive experience with the InSPAL program. They showed levels of excitement whilst seeing the virtual **environment** and experiencing new activities that they would not normally encounter in their day to day learning environment (ie) navigating through virtual space via reaching to touch objects that 'pop' and fall to the ground, transforming into another object.

At the beginning of the training sessions many of the students looked at the screen using peripheral vision but later they would look at the screen straight on and become more focused. For those students who exhibited behavioral/ or emotional issues in the conventional classroom, they also showed similar behaviors in the InSPAL training sessions. Close partnership with the teachers enabled us to make improvements in these areas, helping to strengthen their learning potential.

Overall, the teachers responded that the training students received had a positive outcome in two areas: 1) Greater ability to interact with the learning scenarios and 2) More students able to raise their hands post training.

The InSPAL program encouraged SID students, through interactive communication with the virtual reality scenarios and the teacher/trainer, to learn to interact and communicate, increase attention span and engage in self-control. Our working hypothesis is that through these activities with the 3D virtual world, SID students will learn to develop or enhance pre-learning skills preparing SID children to learn and grow in the conventional classroom environment. During the InSPAL session, activity and observational data are collected and video are taken to enable us to subsequently analyse / decipher the efficiency of the training protocol and the learning scenario design.

Acknowledgement. We would like to thank the support and valuable input of the teaching and professional staff of the Mental Health Association of Hong Kong – Cornwall School. The work presented in this paper is funded by the Quality Education Fund, Hong Kong SAR, Project No. 2010/0072.

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How Online and Hybrid Programs Can Be Used to Reform Curricula

Applications to Graduate Business Education

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Abstract. Graduate business education, and in particular MBA programs, are under increasing scrutiny for their questionable relevance to the business community. The rapidly evolving global economy calls for school curricula to be updated on a regular basis. There are inherent challenges endemic to curriculum reform that protects the status quo, and these obstacles can be difficult to overcome. The development of online and hybrid programs offers a new dynamic to the curriculum review process, and may provide an opportunity to disrupt the inertia that often characterizes curricula review processes. The interaction of the steps necessary for building an online or hybrid program provide a vehicle for engaging in curricula reform, even in on-ground program settings. The purpose of this paper is to highlight the recent insights gained from implementing both online and hybrid programs on curricula design and reform.

Keywords: Curriculum reform, online learning, hybrid learning, faculty collaboration, graduate business education.

1 Introduction

The relevancy of graduate business education continues to be been called into question [2] [10]. There are fundamental concerns about whether students graduate with the skills that they need to acquire good jobs and succeed in a rapidly evolving business environment. Many critics claim that schools focus too much on the scholarly output of their faculty, versus the quality of their graduates. In addition, there is a perennial debate about whether schools effectively enhance students' "soft skills," including communication and team-building. Instead, it is claimed, schools focus more on enhancing students' technical skills, such as financial and statistical analysis, and treat business like an academic discipline, versus a profession. Critics claim this is detrimental to the relevance of graduate business education.

Globalization also brings about a significant *rethink* of the content of graduate business education. There are questions as to whether the curricula that served graduate business schools over the last 20 years will continue to serve them well over the

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 208–218, 2013.

coming decades. Graduate business schools are being called by their accrediting body to become globally aware and proficient [5]. Schools must prepare students to perform competently in a world of global business competition. If colleges and universities are to heed this call, a primary move would include a shift in business school curricula. Taking the business discipline of economics as an example, 20 years ago it was common to offer courses on Macroeconomics that focused solely on the national economy of a particular county. International economics was considered an entirely different subject. With the growth of global interdependence, the demarcation lines between Macroeconomics and International Economics have become blurred, as so much of what a national economy faces relates to global issues.

In addition to changes that should occur within specific disciplines, noted in the example above, changes must also occur in overall program design and the way that courses link together. Nevertheless, critics contend that more change must occur, and at a more rapid rate. And in a rapidly changing business environment, curriculum models must keep pace; otherwise they fall out of relevancy with the marketplace [4]. This article is organized as follows 1) a discussion on curriculum design and reform; 2) an introduction to online and hybrid programs; and 3) the presentation of a specific application.

2 Curriculum Design and Reform

2.1 Inception of New Curricula

The definition of curriculum can be characterized in different ways [8]:

- The content of a discipline
- The design and content of a program
- Student experience of learning
- Interaction of teaching and learning

Although there is some overlap between these different concepts, for the purposes of this paper, the focus will be on the design and content of a program.

As it relates to the inception of new programs, there is a significant amount of scholarly work in laying out best practices and approaches [1] [3] [8]. Three elements appear common to most of the work in this arena, over the past 50 years:

1. Development of Learning Goals/Outcomes
2. Design of Assessment Techniques/Methods
3. Architecture of Teaching/Learning Approaches

These approaches can be relied upon by curricula designers in developing new curricular programs. Figure 1 illustrates this basic process.

Fig. 1. Traditional Approach to New Program Design

2.2 Curriculum Revision

There has been less scholarly work in the area of curriculum reform. It is noted that the process of curriculum reform can be more challenging than the development of new programs [9] [14]. "Politics" often play a bigger role in the process of reform relative to inception, leading to higher failure rates. Explanations include [15]:

- There are more questions to be answered in a curricular reform process (e.g. the question of whether a program *needs* to be reformed must be answered), offering more potential points of failure.
- The process of curriculum reform is not well agreed upon, relative to the process for new program development.
- Ownership-bias: as described by behavioral economists, once one owns an object, one tends to place more value on it. Applied to the process of curricular reform, once a discipline has an established course in the curriculum, instructors within that discipline are more likely to engage in turf battles for what they already own.

These factors, and perhaps others, lead to a situation where the curricular reform process can be very challenging. Yet, as noted earlier, the need for curriculum reform has likely never been greater for graduate business education.

Though the process of curricular reform is not well-defined, there are some elements inherent in most curriculum reform endeavors [9]. First, there are drivers for change, and time needs to be dedicated to discussion about these drivers. For graduate business educators, potential drivers include:

- Evolving business environment, necessitating different skills needed for graduates
    - Changing strategy and educational philosophy of institution
    - Assessment results showing deficiencies in program meeting intended goals

Significant dialogue on the driver(s) of interest is a necessary component, so there is clear understanding among all stakeholders. Following this dialogue, a variety of "entry points" for further exploration of needed reform may be taken. Examples of such entry points include:

1. Focusing on graduate's desired attributes
2. Focusing on the program learning outcomes/goals
3. Focusing on the ultimate aim/purpose of the program

These potential entry points provide an opportunity for further listening and questioning. Contextual factors must then be considered in the process of reform. Examples include:

- Faculty impacts (e.g., disciplines)
- Revision timetables
- Political climate for change
- School/University strategic plan
- Process constraints
- Competition
- Changing technology

Once these items have been considered and discussed, and assuming the process has not derailed by this point, a curriculum revision proposal may be developed. Figure 2 illustrates this flexible approach to curriculum revision:

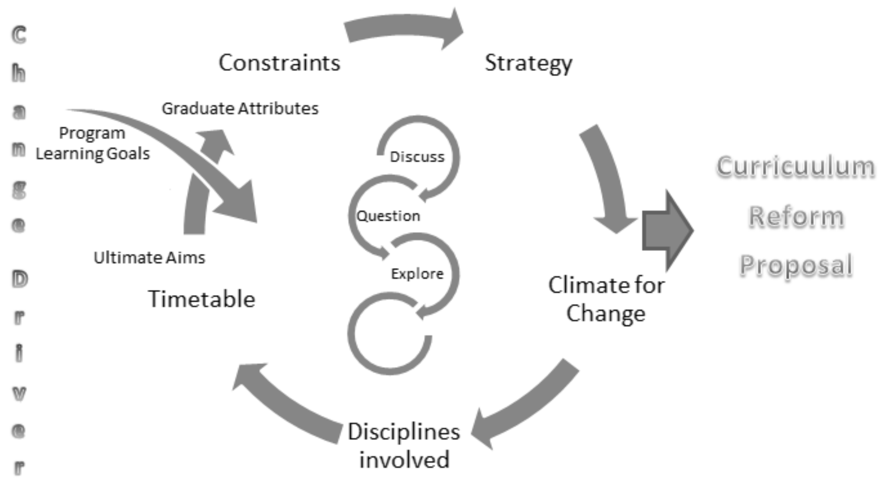

Fig. 2. Curriculum Revision Process

3 Development of Online and Hybrid Programs

3.1 Benefits of Online and Hybrid Course Design

The development and growth of online and hybrid programs provides a different framework for considering program revision. Instead of revising *content*, the focus is on revising *delivery*. For a faculty member moving from on-ground to online (or some combination therein), a substantial investment of time and energy is required, along with many specific steps to be followed [12]. This process can lead to high quality course development and can enhance the curriculum reform process as well. Benefits derived can be applied to programs that are online, hybrid, or even on-ground.

3.2 Focused on Learning

In an online or hybrid course, instructors do not have the same level of face-to-face interaction as in an on-ground course. Thus, the thoughtful instructor, in the process of course design, is naturally inclined to place themselves in the shoes of the learner and think carefully about their experience in the course. What occurs as a consequence is a shift in thinking primarily away from teaching, and instead focusing on *learning*. It leads instructors to focus on learning outcomes and acquired attributes, two elements that are inherent in a course revision process. Thus, through the discipline of the course development process, the instructor uses a different framework for thinking about the learning process, one that is important to the course revision process.

3.3 Courses as Building Blocks

The advent of mobile learning has impacted the design and structure of blended and online courses and programs [6]. Students are engaged in learning more frequently, but in smaller portions, particularly adult learners. A 4-hour lecture is not well aligned with most student needs. In the process of developing an online or hybrid course, faculty break their courses into smaller pieces, thinking carefully about how they connect into order to achieve the learning outcomes. Once one has engaged in the process of examining their course as a set of "building blocks," they are naturally inclined to ask the question, "How might my course look if I were to build it over again from scratch?" Another pertinent question is, "How might this program look if it were built over again from scratch?" These are the types of questions that need to be answered in a program revision process.

3.4 Working as Teams

When a new hybrid or online program is created, faculty often work in teams during the implementation phase. Discussions take place about ensuring a consistent student experience across courses. This often leads to aligning the technology tools that will be employed. These opportunities to work as members of teams can build trust and a sense of shared purpose. Often, the lack of trust, and the differences between disciplines, can undermine attempts at innovation within existing programs [13]. This attribute is referred to as "faculty heterogeneity," and this characteristic can be quite prominent in a program that incorporates numerous disciplines, such as an MBA degree. Within these and similar contexts, the course revision process can be especially challenging. Thus, the deployment of an online or hybrid program can mitigate some of the impact of faculty heterogeneity, by bringing faculty groups together for a common cause.

3.5 Facing Hard Decisions

Course development can be expensive in an online or hybrid program. A trend within US institutions is that faculty are often given release time or stipends for course development, and the employment of course designers exacts an additional cost. In addition, the increased usage of rich multimedia can add to the bill for course development [12]. Within this context, and in particular for online and hybrid courses that are built on a student-cohort framework, decisions need to be made about which courses (in particular, electives) should be offered. An online program, with high front end costs, may not have the luxury of offering electives as frequently as might be the case in an on-ground program. Thus, hard decisions-which courses to include and which to exclude-must be made. This is the heart of program revision, particularly when faculty heterogeneity is present: making difficult decisions. Nevertheless, these decisions made in an online or hybrid program can have spillover benefits in a program revision process. Figure 3 incorporates all of the benefits highlighted in this section.

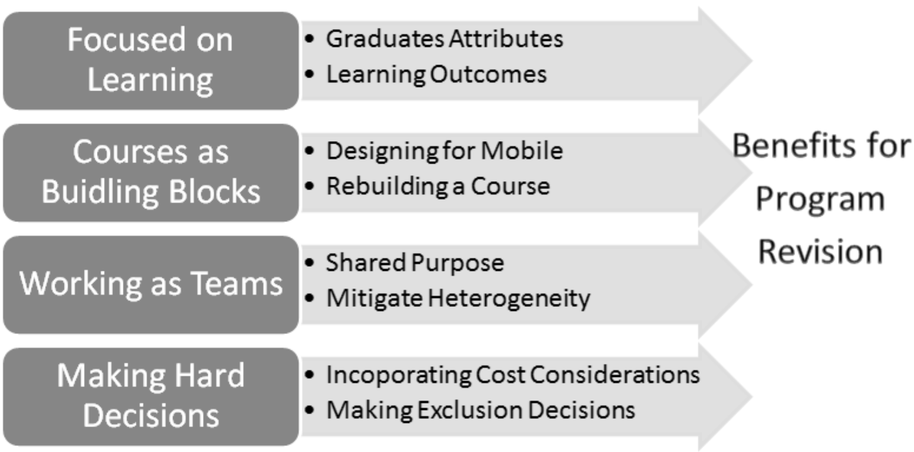

Fig. 3. Spillover Benefits of Online and Hybrid Course Design

4 Application in Graduate Business Education

4.1 Graziadio School at Pepperdine University MBA Program

The Graziadio School of Business and Management at Pepperdine University offers a traditional on-ground part-time MBA program for working professionals in the Los Angeles area. Pepperdine University was one of the first universities on the West Coast to offer MBA programs for working professionals and until most recently, the largest provider of part-time MBA programs in the Los Angeles area. Increased competition from other regional providers, as well as from online and hybrid programs, has shifted the market, though the Graziadio School still has a sizeable part-time MBA program, relative to peer universities and those accredited by AACSB. The current curriculum for the part-time Fully-employed MBA program (FEMBA) is approximately 15 years old. The program revision 15 years ago incorporated the following considerations:

- Increased student choice and flexibility, tripling the amount of elective courses that students could take in the program, and incorporating the opportunity to earn a concentration in the course of study. This necessitated a decrease in core course requirements.
- Enhanced student experiential learning, including the requirement of multiple integration learning opportunities, manifested in the offering of cross-disciplinary computer simulation experiences.
- Incorporation of an Information Systems course offering, as well as a shift away from analytical core course offerings in management science and economics.

4.2 Course Revision Experience

The MBA curriculum revised 15 years ago remains in place with very minor revisions (e.g. the addition of concentrations and elective offerings). After the core curriculum was in place for 10 years, an effort was made to make a curriculum revision process, which resulted in a package of recommended minor revisions that, taken as a whole, would be considered a moderate program revision. This revision shifted the discipline offerings in the core and thus faculty heterogeneity was a prominent factor in the faculty deliberations. In the end, the revisions were not implemented, though the vast majority of faculty believed they would have enhanced the FEMBA program. This suboptimal result in MBA course offerings is a common result, as noted by others [11].

During this same 15 year period, five new programs have been approved and implemented, with two additional approved and awaiting implementation. This is consistent with the earlier observation: it is simpler to develop new programs than it is to revise existing programs.

Within this same 15 year period, two other programs have achieved successful revision processes within the Graziaido School. One is a Master's of Science in Organization Development (MSOD) program, where faculty heterogeneity in the process was low (faculty who teach in the program come from three aligned disciplines). The other, the Executive MBA Program, would be considered a moderate revision and resulted in minimal realignment of credits across disciplines. The new MSOD curriculum is offered in a hybrid learning format.

4.3 Introduction of an Online MBA Program

In early 2012, a decision was made at the Graziadio School at Pepperdine University to offer an online MBA program for implementation in January 2013. Though faculty at the school had been engaged for years in e-learning related faculty development activities, and some faculty offered hybrid courses as part of the FEMBA program, this was the first time the school decided to offer a program that was fully-online. In summer 2012, a faculty group was assembled to commit to a course development process and eventually teach in the program. This faculty group, with low to high levels of online teaching experience, was guided by e-learning experts to determine standards for course design, faculty-student interaction, and other course elements. Some of the characteristics of the online program include: high touch, limited residency, m-learning focus, comparable curriculum, and sustainability. The decision was also made to develop a strategic partnership with a well-known program design team instead of developing the new program completely internally.

4.4 Spillover Benefits for Program Revision

Faculty engaged in the course design process receive course-release credit equivalent to the number of course units. The faculty report receiving high levels of internal reward for rethinking how their course is taught, and more importantly, learned. Participating faculty focus on meeting course objectives and assessment, which meets another institutional objective, building a culture of assessment.

Instructors who engage in the process of breaking their course down into its building blocks are energized by the process of thinking how their course might look if they have the opportunity to "build it from scratch." They report incorporating revisions into their on-ground courses from the process of developing an online course. The faculty team also report a sense of shared purpose and common vision as they embark on a new journey of delivering graduate business education in an online framework. Faculty at the Graziadio School tend to live in disparate locations, reflecting the geography of Los Angeles. Thus, the opportunity to work together on a project, and build a sense of trust, is a welcome experience. This logistical complexity also opens up the opportunity for online collaboration [7].

In the course of deploying the online MBA program, decisions were made about which courses to offer as part of three concentrations: Finance, Marketing, and Leadership & Managing Organizational Change. In the on-ground program, students have multiple courses to choose from in designing their concentration. However, in the online program choices are limited as there is a need to amortize the cost of course development. Faculty groups that take responsibility for the concentrations were approached to put forth their recommendations. As part of this process, two of the faculty groups came back with proposals to completely revamp their concentration curricula, impacting both the online and on-ground concentrations. This was an unexpected result, but followed from the faculty groups going through many of the steps of a program revision. Prior to the need to make a difficult decision, there was no impetus for revising the concentrations.

4.5 Curriculum Implementation

Implementing new curriculum is also beset with a variety of challenges including: technological trends and adoption patterns, defining and monitoring performance metrics and rubrics, and institutional barriers and constraints. Once again the internet plays a constructive role. Fig 4. presents the curriculum implementation platform used at the Graziadio School. The Learning Management System (LMS) is the core driver of this learning system. The collaboration network allows faculty and administrators to participate in all phases of the implementation effort through engaging in best practices.

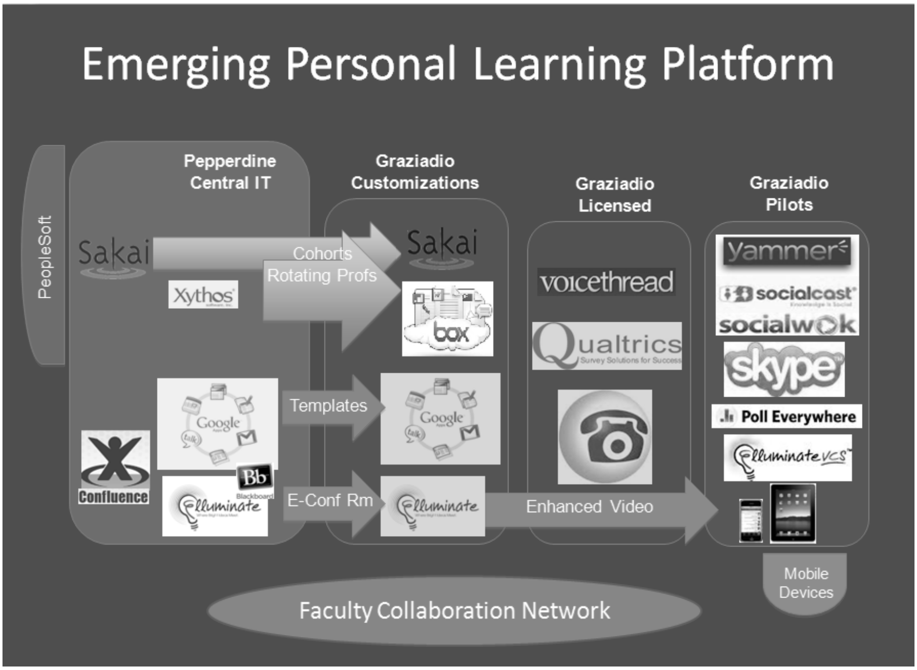

Fig. 4. Curriculum Implementation Platform

5 Conclusion

The current economic and business climate calls for curricular reform within graduate business school programs. Yet, curricular reform processes are wrought with obstacles and challenges. One unexpected kick-start to curricular reform can come through the development of online and hybrid courses. The development of online and hybrid courses can provide the opportunity for instructors to be more learner-focused, to explore new ways of constructing their programs, and to require that hard decisions are made about course offerings. In addition, if the development of an online or hybrid program is a team activity, there is an opportunity to build trust among faculty across disparate disciplines. One vehicle for accomplishing this goal is through the use of faculty collaboration networks.

An application of this hypothesis is provided by examining the experience already gleaned from Pepperdine's new online MBA program. This program was launched in January 2013, and curricular revisions are already taking place, both in the online MBA program and the on-ground program. These curricular revisions would likely not have taken place without the advent of the online MBA program. Similar experiences were observed from Pepperdine's hybrid MBA program which was initiated several years ago. These results demonstrate that there can be significant positive spillover benefits from the deployment of a new online or hybrid program. This result and case study should prove useful to administrators and instructors who are engaged in curricular reform.

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An Integrated Approach to Developing Visual Literacy

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Abstract. Developing instructional approaches and learning activities on applicable visual literacy training for K-12 teachers can be a challenge to teacher preparation programs and courses. This study illustrated how an integrated approach, which incorporated learning activities/projects and blended learning process, was adapted and implemented into one graduate education course for increasing pre-service and in-service teachers' visual literacy skills. The effectiveness of such an instruction approach on participants' visual literacy competences was examined. Most participants indicated that they met all of Visual Literacy Competency Standards for Higher Education.

Keywords: Visual Literacy, Project-Based Learning, Blended Learning Process, Online Posters, Online Presentations.

1 Introduction

The proliferation of information resources and rapid technological change are lineaments of our contemporary society [1][2]. Digital and social technologies, especially digital images and visual media in contemporary culture are changing what it means to be literate in the 21st century. In today's highly visual society, visual imagery is no longer supplemental to other forms of information [3]. Despite a widespread belief that all pictures are valuable, the proverb "a picture is worth a thousand words" does not necessarily make sense to anyone at anytime, anything, and anywhere [4]. It is important for individuals to be able to critically view, use, and produce visual content in order to engage capably in a visually-oriented society [3].

Braden [5] defined visual literacy as the ability to understand, use, and create with images effectively. In 2011, Association of College & Research Libraries (ACRL) set up Visual Literacy Competency Standards for Higher Education [3], so a visually literate individual can: (1) determine the nature and extent of the visual materials needed; (2) find and access needed images and visual media effectively and efficiently; (3) interpret and analyze the meanings of images and visual media; (4) evaluate images and their sources; (5) use images and visual media effectively; (6) design and create meaningful images and visual media; (7) understand many of the ethical, legal, social, and economic issues surrounding the creation and use of images and visual media, and access and use visual materials ethically. However, visual literacy competencies cannot be taken for granted and need to be taught, supported, and integrated into the curriculum [3]. Notably, in order to capture the improvements

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 219–231, 2013.

in effectiveness, efficiency, and productivity, K-12 pre-service and in-service teachers must be prepared through teacher preparation programs and courses to learn what visual literacy is and what it can do. Teachers usually lack accurate information, necessary skills, and timely guidance on emerging visual media and visual content. They are often ill prepared and under trained to use these tools and materials in the classroom. In return, implementations are often superficial or misused, leading to rapid decline. It appears that there is a critical and urgent need for teacher preparation programs/courses to have instructional approaches and learning activities on applicable visual literacy training for their teacher candidates.

Accordingly, our present study attempts to demonstrate how an instructional approach on improving teachers' visual literacy skills has been implemented into one graduate education course. The following questions guided this study:

- How can we adapt and implement an instructional approach which incorporated learning activities/projects and blended learning process for teacher preparation courses?
- What are the effects of such an instructional approach on visual literacy among learners?

2 Method

2.1 Participants and the Course

The participants of this study came from one section of students (N = 10) who were enrolled in graduate course entitled *Computer Applications and Resources in Teaching*, offered at a university in the northeastern region of the United States during the fall semester in 2012. All the 10 participants were pursuing graduate level education programs in content areas of biology, chemistry, English, literacy, mathematics, social studies, and technology, etc.

The course entitled *Computer Applications and Resources in Teaching* focuses on combining integration of computer applications and resources into teaching and learning. It is a required course for students who are in the Master of Science in Education program at the university. The course includes a series of technology integration activities. As a newly added component, the development of visual literacy projects is a part of these learning activities.

Similar to other hybrid courses in the university, two-thirds of this course learning activities has been moved to the computer mediated learning (CML) environment while the contact time in traditional face-to-face (F2F) teaching and learning has been reduced to one-third of the course.

2.2 Projects and Tools

A variety of research has indicated that project-based learning can capture the complexities of real life situations. Project-based learning can provide an effective way for pre- and in-service teachers understanding the connection of knowledge to the contexts of its application, and provide them with opportunities for self-reflection and a sense of agency. Essentially, project-based learning is based on tasks, groups, and sharing. It provides a practical method of combining many of the elements of authentic activities and collaborative learning [6][7][8][9]. Group project design and development, in particular, can help learners develop skills specific to collaborative efforts, and allow them to: handle more complex problems than they could do alone, share diverse perspectives and responsibilities, combine knowledge and skills, etc. [10].

Among real-world teaching and learning activities, poster and presentation are probably two of the most common and widely used educational projects in today's classrooms. Creating effective posters and presentations require developers to have solid visual literacy skills. Therefore, we chose the development of posters and presentations as group projects for participants in this study.

Comparing to physical cardboard posters, an online poster is a flexible platform, in that developers can mix, mash-up, and use almost any form of media for a project on an online canvas [11]. In addition, an online poster usually can be interactive, re-used, durable, and attractive to a large audience. There are several virtual poster sites available. As one of leading education platforms, Glogster EDU can empower users with the technology to create online multimedia posters with text, photos, videos, drawings, data attachments, and so on [12]. We selected Glogster EDU for this study due to its advantages of the user-friendly interface, excellent functionality, and popularity.

Comparing to standalone and linear structure presentation software such as Microsoft PowerPoint, Prezi is a cloud-based presentation software and storytelling tool for presenting ideas on a virtual canvas [13]. Prezi has a big visual impact on nonlinear thinking, organizing, and presenting. It can help users to see the big picture and to understand relationships, sequences, and options [14]. For this reason, we selected Prezi for this study.

Both Glogster EDU and Prezi provide the online collaboration features that support computer-mediated learning and communication for group project development.

2.3 STEP and Procedure

The STEP (scaffolding, transaction, evaluation, and presentation) approach, which was developed from our previous studies, emphasized enriching students' experience in asynchronous online learning environments [15]. STEP included four interrelated stages: (1) the scaffolding before starting new learning topics; (2) the transaction during the learning process; (3) the evaluation during and after each learning topic; and (4) the presentation of outcomes.

The results of our previous studies indicated that STEP had strong impacts on online learning community [15], social presence [16] [17], and sense of community [18]. In our recent studies, we applied the derived STEP into blended learning environments that combined face-to-face (F2F) classroom instruction with computer-mediated learning (CML), and found enormously positive effects on improving inquiry-based learning, collaborative action research, and teachers' technological pedagogical content knowledge (TPACK) [19][20][21].

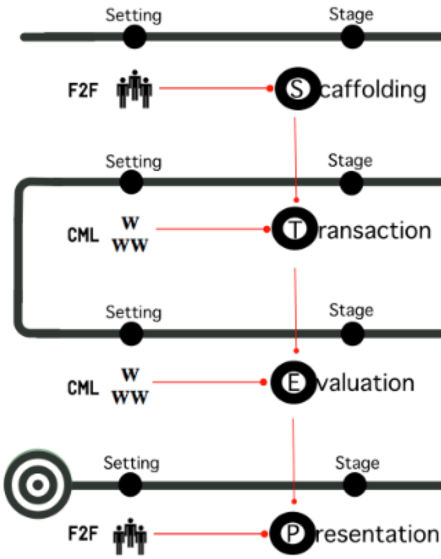

Fig. 1. The STEP approach

As shown in Figure 1, STEP approach was adapted and implemented into this study, which incorporated the development of visual literacy projects and blended learning process.

Stage One: Scaffolding

It is crucial to create a foundation of necessary concepts and skills for project-based learning activities and development [7]. From this perspective, in the F2F classroom environment, a series of scaffolding strategies and actions were taken: (1) the rationale, key points, and standards of visual literacy were deliberated and introduced; (2) examples of online posters and presentations were demonstrated and analyzed; (3) Glogster EDU vs. traditional cardboard and Prezi vs. PowerPoint were discussed; (4) related materials and online resources of creating effective poster and presentation projects were distributed and provided; (5) hands-on sessions on exploring both Glogster EDU and Prezi were implemented. This scaffolding served two ends: the first end was to share the related concepts/knowledge and basic technological skill that participants needed to develop their undertaking actual group projects; the second end was to help participants reflect and discuss the possibilities for extending the ideas and technologies into their content areas. In the meantime, the instructor assisted participants in initiating the project group, launching the call for interest, organizing the project group (2-5 members for each team).

Stage Two: Transaction

Developing group projects allows group members to be more effective learners and social beings. From this perspective, in the CML environment, participants began their group projects on the more flexible levels of skills, understanding, and complexity. They focused and worked on: (1) reviewing existing online poster/presentation projects and related resources; (2) sharing their thoughts and comments, and forming their own topics and plan of collaborative group projects; (3) determining, finding, and selecting images and visual media for group projects; (4) designing and developing meaningful poster and presentation projects by using Glogster EDU and Prezi; (5) sharing online projects with instructor and peers for assessment and feedback.

Stage Three: Evaluation

Formative assessment and periodical evaluation provide numerous benefits to both the instructors and learners on the project-based learning activities and development. On one hand, instructors can get a clear view of what is and what is not being learned by learners, and how to adapt their further instruction accordingly. On the other hand, learners can have the opportunity to receive feedback from instructors and to revise their learning processes as necessary, etc. [22]. From this perspective, in the CML environment, the instructor worked with participants: (1) providing "just-in-time" suggestions/guidance on the aspects of contexts and technical parts; (2) discussing challenges, questions, and concerns that participants experienced; (3) obtaining possible and potential solutions, strategies, resources, and steps to enhance participants' group projects; (4) engaging in continuous, thoughtful analysis of learning process and outcome.

Stage Four: Presentation

Presenting projects is an authentic activity that provides an enormous motivation for students [6][9]. "Presentations, coupled with authentic outcomes and fairly explicit criteria for what counts as a good plan, can provide a strong incentive to prepare and revise." [22] From this perspective, in the F2F classroom environment, participants presented their final group projects and their reflection of their learning experiences in front of the class. Class interactions and classmates' evaluations were generated during and after the presentations. The instructor encouraged participants to continue implementing visual literacy learning activities and projects into their own classroom teaching and learning, and then started to initialize and scaffold the next learning activity.

3 Results

To assess the effectiveness of the STEP approach, which incorporated the development of group projects and blend learning process on pre- and in-service teachers' visual literacy, participants from the course were asked to fill out the online Survey of ACRL Visual Literacy Competency Standards for Higher Education voluntarily at the end of the fall semester in 2012. The survey consists of 7 standards and 90 learning outcomes with response scale from "met" "developing" to "not met".

The present study clearly demonstrated positive effects of developing group projects through STEP approach on participants' visual literacy competencies. As indicated in Table 1 (see Appendix), 8 out of 10 participants indicated that they met all seven ACRL Visual Literacy Competency Standards. The rest 2 participants indicated that they met most of those standards.

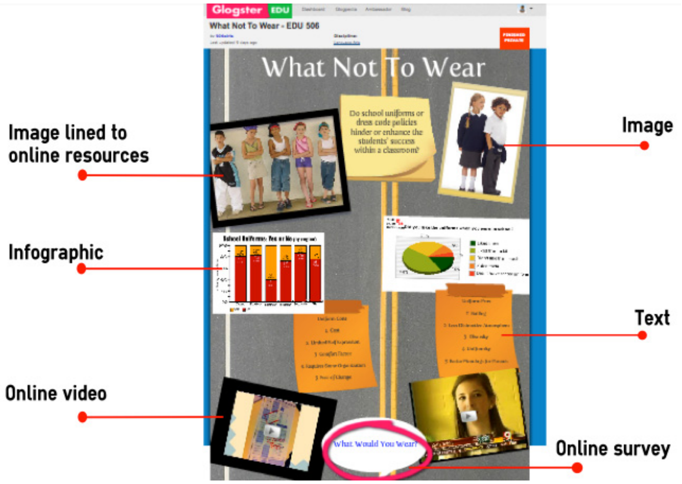

Fig. 2. "What Not To Wear" – A sample of participants' online poster projects

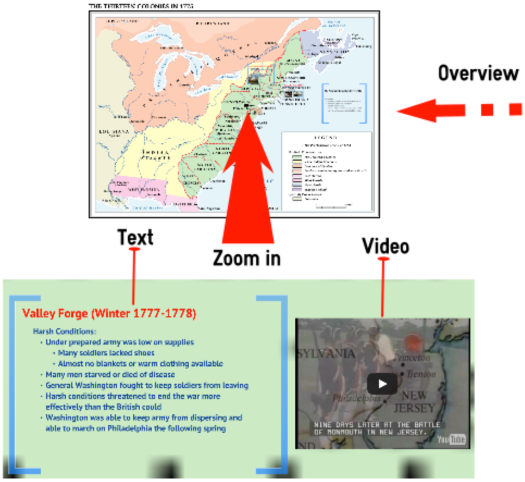

Fig. 3. "The American Revolution" – A sample of participants' presentation projects

These findings correlated with actual projects from participants. One sample of participants' online poster projects was depicted on Figure 2, and one sample of participants' online presentation projects was depicted on Figure 3.

4 Discussion

The findings of this study lead to a couple of conclusions about increasing K-12 pre-service and in-server teachers' visual literacy competences. Firstly, it is important for teacher preparation programs/courses to have effective instructional approaches on applicable visual literacy training for their teacher candidates. We find that instructors can build up educators' visual literacy competences through an integrated approach in F2F and CML environment. The effectiveness of STEP approach for developing visual literacy has been confirmed in this study. Secondly, this study also indicates that in order to increase educators' visual literacy skills through educational programs/courses, the development of applicable, common, and real-world projects such as online poster and presentation project design and development, which have enormous involvements of using visual content and visual media, should be considered and implemented.

Although a clear case has been made for the effectiveness of using an integrated approach to developing visual literacy, this study had several limitations. This study primarily limited by its small sample size. There were only 10 participants who participated in the study, and the pretest of participants on ACRL Visual Literacy Competency Standards was not conducted. Moreover, due to the small number of participants, other related variables such as students' learning style and cognitive preference [23] were not investigated. We suggest that larger population with pretest and posttest design to be investigated for further research.

Acknowledgement. This study was supported by State University of New York Innovative Instructive Technology Grant (IITG 2012-2013).

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Appendix:

Table 1. Participants' responses on visual literacy competency standards

ACRL Visual Literacy Competency Standards and Learning Outcomes	*N = 10*		
	Met	Developing	Not Met
Standard One: The visually literate student determines the nature and extent of the visual materials needed.	10	0	0

Defines the purpose of the image within the project	10	0	0
Defines the scope and environment of the planned image use	9	1	0
Articulates criteria that need to be met by the image	10	0	0
Identifies key concepts and terms that describe the needed image	10	0	0
Identifies discipline-specific conventions for image use	8	2	0
Explores image sources to increase familiarity with available images and generate ideas for relevant image content	9	1	0
Investigates the scope, content, and potential usefulness of a range of image sources and formats	9	1	0
Identifies different image and visual media types and materials	9	1	0
Articulates ways images can be used to communicate data and information	10	0	0
Recognizes that existing images can be modified or repurposed to produce new visual content	7	3	0
Standard Two: The visually literate student finds and accesses needed images and visual media effectively and efficiently.	10	0	0
Identifies interdisciplinary and discipline-specific image sources	10	0	0
Articulates the advantages and disadvantages of various types of image sources and retrieval systems	9	1	0
Recognizes how the image search process is affected by image rights and use restrictions	8	2	0
Uses specialized online or in-person services to select image sources	7	2	1
Selects the most appropriate image sources for the current project	9	1	0
Develops a search strategy appropriate to the image need and aligned with available resources	10	0	0
Recognizes the role of textual information in providing access to image content, and identifies types of textual information and metadata typically associated with images	7	3	0
Recognizes that images are often organized differently than text-based information and that this affects the way images can be accessed	9	1	0
Identifies keywords, synonyms, and related terms for the image needed, and maps those terms to the vocabulary used in the image source	10	0	0
Uses images to find other images through exploration, social linking, visual search engines, or browsing	8	2	0

Performs image and topical research concurrently, with each informing the other in an iterative resource-gathering process	8	2	0
Assesses the quality, quantity, and appropriateness of images retrieved, and revises the search strategy as necessary	9	1	0
Retrieves or reproduces the needed image using appropriate technologies or systems	10	0	0
Accesses physical objects as needed to support the image research objective	7	3	0
Organizes images and the information that accompanies them for personal retrieval, reuse, and scholarly citation	10	0	0
Standard Three: The visually literate student interprets and analyzes the meanings of images and visual media.	10	0	0
Looks carefully at an image and observes content and physical details	10	0	0
Reads captions, metadata, and accompanying text to learn about an image	10	0	0
Identifies the subject of an image	10	0	0
Examines the relationships of images to each other and uses related images to inform interpretation	10	0	0
Recognizes when more information about an image is needed, develops questions for further research, and conducts additional research as appropriate	10	0	0
Describes cultural and historical factors relevant to the production of an image	8	2	0
Examines the purposes and meanings of an image in its original context	10	0	0
Explores choices made in the production of an image to construct meaning or influence interpretation	9	1	0
Describes the intended audience for an image	10	0	0
Explores representations of gender, ethnicity, and other cultural or social identifiers in images	9	1	0
Investigates how the audience, context, and interpretation of an image may have changed over time	10	0	0
Describes pictorial, graphic, and aesthetic elements of an image	9	1	0
Identifies techniques, technologies, or materials used in the production of an image	9	1	0
Determines whether an image is an original or a reproduction	8	1	1
Examines an image for signs of editing, alteration, or manipulation	7	3	0
Participates in classroom and other discussions about images	10	0	0

Seeks expert and scholarly opinion about images, including information and analysis found in reference sources and scholarly publications	9	1	0
Informs analysis with discipline-specific perspectives and approaches	10	0	0
Standard Four: The visually literate student evaluates images and their sources.	10	0	0
Evaluates how effectively an image achieves a specific purpose	10	0	0
Assesses the appropriateness and impact of the visual message for the intended audience	10	0	0
Critiques persuasive or manipulative strategies that may have been used in image production to influence interpretation	7	3	0
Evaluates the use of visual signs, symbols, and conventions to convey meaning	10	0	0
Analyzes the effect of image editing or manipulation on the meaning and reliability of the image	8	2	0
Determines the accuracy and reliability of graphical representations of data	10	0	0
Evaluates images using disciplinary criteria	9	1	0
Evaluates the aesthetic and design characteristics of images	10	0	0
Evaluates the technical characteristics of images	9	1	0
Evaluates the quality of image reproductions, based on indicators such as color accuracy, resolution, manipulation levels, and comparison to other reproductions	10	0	0
Evaluates information that accompanies images for accuracy, reliability, currency, and completeness	8	2	0
Uses observation of visual content to evaluate textual information	8	2	0
Verifies information that accompanies images by consulting multiple sources and conducting research as necessary	7	3	0
Assesses reliability and accuracy of image sources based on evaluations of authority, and point of view or bias	10	0	0
Makes judgments about image sources based on evaluations of image and information quality	10	0	0
Critiques how an image source may create a new context for an image and thereby change its meaning	8	2	0
Standard Five: The visually literate student uses images and visual media effectively.	10	0	0
Plans for strategic use of images and visual media within a project	10	0	0
Selects appropriate images and visual media aligned with a project's purpose	10	0	0

Integrates images into projects purposefully, considering meaning, aesthetic criteria, visual impact, and audience	10	0	0
Uses images for a variety of purposes	10	0	0
Uses images for subject-specific and interdisciplinary research, communication, and learning	10	0	0
Uses appropriate editing, presentation, communication, storage, and media tools and applications to prepare and work with images	10	0	0
Determines image file format, size, and resolution requirements for a project, and converts images accordingly	8	2	0
Edits images as appropriate for quality, layout, and display	10	0	0
Experiments with different ways of integrating images into academic work	10	0	0
Uses visual thinking skills to clarify and solve problems	9	1	0
Writes clearly about images for different purposes	10	0	0
Presents images effectively, considering meaning, aesthetic criteria, visual impact, rhetorical impact, and audience	9	1	0
Discusses images critically with other individuals, expressing ideas, conveying meaning, and validating arguments	10	0	0
Includes textual information as needed to convey an image's meaning	10	0	0
Reflects on the effectiveness of own visual communications and use of images	10	0	0
Standard Six: The visually literate student designs and creates meaningful images and visual media.	10	0	0
Creates images and visual media to represent and communicate concepts, narratives, and arguments	10	0	0
Constructs accurate and appropriate graphic representations of data and information	10	0	0
Produces images and visual media for a defined audience	9	1	0
Aligns visual content with the overall purpose of project	10	0	0
Plans visual style and design in relation to project goals	9	1	0
Uses aesthetic and design choices deliberately to enhance effective communication and convey meaning	10	0	0
Uses creativity to incorporate existing image content into new visual products	9	1	0
Experiments with image-production tools and technologies	8	2	0
Identifies the best tools and technologies for creating the visual product	9	1	0
Develops proficiency with a range of tools and technologies for creating images and visual media	10	0	0
Evaluates personally created visual products based on project goals	10	0	0

Evaluates personally created visual products based on disciplinary criteria and conventions	10	0	0
Reflects on the role of personally created visual products as a meaningful contribution to research, learning, or communication	10	0	0
Validates personally created visual products through discourse with others	9	1	0
Revises personally created visual products based on evaluation	8	2	0
Standard Seven: The visually literate student understands many of the ethical, legal, social, and economic issues surrounding the creation and use of images and visual media, and accesses and uses visual materials ethically.	8	*2	0
Develops familiarity with concepts and issues of intellectual property, copyright, and fair use as they apply to image content	10	0	0
Develops familiarity with typical license restrictions prescribing appropriate image use	8	1	1
Recognizes one's own intellectual property rights as an image creator	10	0	0
Identifies issues of privacy, ethics, and safety involved with creating, using, and sharing images	8	2	0
Explores issues surrounding image censorship	9	1	0
Identifies institutional policies on access to image resources, and follows legal and ethical best practices	10	0	0
Tracks copyright and use restrictions when images are reproduced, altered, converted to different formats, or disseminated to new contexts	8	0	1
States rights and attribution information when disseminating personally created images	7	3	0
Gives attribution to image creators in citations and credit statements to acknowledge authorship and author rights	10	0	0
Includes source information in citations and credit statements so visual materials can be reliably found and accessed by other scholars and researchers	8	2	0
Cites visual materials using an appropriate documentation style	9	1	0

Generating E-book System Using Cloud Computing: A Cognitive Map and Open Forum Approach

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Abstract. In this paper, we present a new idea of e-book and make a feasibility study to prove it works. Our idea is developing an e-book system on a private cloud computing platform and integrating a forum and a cognitive map with the e-book which is executable in an electronic device. We want to visualize the e-book and make the e-book more interesting. Through this system, students do not only learn from e-book, but also apply what they have learnt from the e-book.

Keywords: E-book, Cloud computing, Cognitive map, Open Forum.

1 Introduction

1.1 Background of E-Book

An electronic book (e-book, e-book digital book, or e-edition etc) is a book-length publication in digital form, consisting of text, images, or both, and produced on, published through, and readable on computers or other electronic devices. [1]

Traditional e-books are read in e-book reader software in personal computer. The software can provide functions including: index, text, picture, login, search, reference, etc.

E-book readers have changed the way people enjoy full-length books, magazines, newspapers, and a wide range of text-based content(including PDF documents). Instead of holding a physical book or publication in your hands, an e-book reader displays text on its built-in screen. [4] An e-book can simply be a traditionally published book that has been adapted into digital form, so it can be read on an e-book reader. When a student looks at the page of printed book versus the page of a book displayed on an e-book reader's screen, what the student will see can be virtually identical. Otherwise the student can customize the layout of the e-book on his/her tablet or e-book reader's screen. [4]

1.2 Cloud Computing

There are a lot of e-book systems, but most of them only allow user to download the e-book. In other words, our system allows teaching staff upload and download the

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 232–243, 2013.

e-book. Now, we are going to use cloud computing platform to form a system with 2 interface: one is to let the teaching staff to upload their lecture notes. The system is then able to generate the e-book from their softcopy automatically, so that student is able to download the e-book from the second interface. The system is supposed to be expandable and portable, since more and more teaching staff will upload their teaching materials to the system. That's why we need to use the cloud computing platform, because cloud computing is easily expandable and migrate to upgrade the hardware configuration.

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name

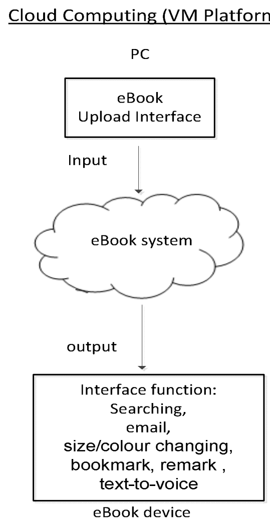

Fig. 1. E-book in cloud computing

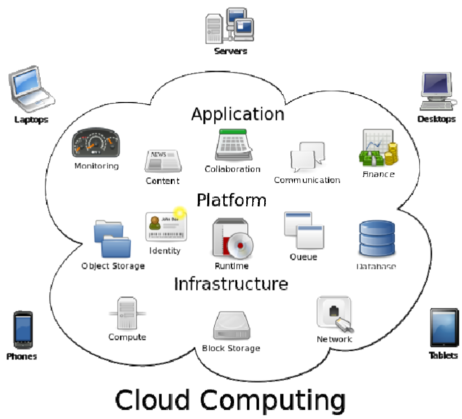

Fig. 2. Cloud computing platform

comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure that it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation as shown in figure 2. [1]

There are many types of public cloud computing:[1]
(I) Infrastructure as a service (IaaS)
In this system, we will develop an application server installed with a virtual machine (VM). The VM will act as an infrastructure of the system (IaaS) to provide facilities such as database, system engine, network, storage and software.

(II) Platform as a service (PaaS)
This cloud system will deliver a computing platform including operating system, programming language execution environment, database, and web server. We can develop and execute the system in this platform.

(III) Software as a service (SaaS)
We will install and operate application software in this cloud platform and users will access the software from (cloud) clients. Even the cloud computing users may need to download the client software. They do not need to manage the cloud infrastructure and platform on which the application is running. This application is different from other applications because of its scalability.

An e-book system will be hosted on the virtual machine (Cloud computing platform) that supports the following features:

- Identify the upload format of the softcopy, and then transfer to the e-book format.
- Add that e-book to the interface, so that the user can choose that e-book and open it.

For the client software, the following features will be supported

- Students are able to search the e-book that they are looking for.
- Download and open the e-book to view it
- e-book features: login, index, text, picture, linkage, video, footnote, email, reference, search

1.3 Problem of Current E-Book

The e-books nowadays are not good enough. Firstly, the e-books' function is not innovative. They are just maintaining the old style design. Secondly, users cannot apply what they have learnt after read the e-books.

Even though some e-books are good in performance and user friendly, the design can be more innovative, educational, and functional.

2 Related Work

2.1 Bloom's Taxonomy

Bloom's Taxonomy refers to a classification of the different objectives that educators set for students (learning objectives). Bloom's Taxonomy divides educational objectives into three "domains": Cognitive, Affective, and Psychomotor (sometimes loosely described as knowing/head, feeling/heart and doing/hands respectively). Within the domains, learning at the higher levels is dependent on having attained prerequisite knowledge and skills at lower levels. A goal of Bloom's Taxonomy is to motivate educators to focus on all three domains, creating a more holistic form of education. [3]

Cognitive domain involves knowledge, comprehension, and critical thinking of a particular topic. Traditional education tends to emphasize the skills in this domain, particularly the lower-order objectives. [3]

There are six levels in the taxonomy, moving through the lowest order processes to the highest:

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

Therefore, according to the Bloom's Taxonomy, students can only maintain at the ***Knowledge*** level after reading an e-book. But after they give opinions to the cognitive map, they will reach ***Application*** or even ***Analysis*** level. Cognitive map not only motivates students to learn more than the content of the e-book, but also encourages students using new knowledge. Students learn how to solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way. They also have to examine and break information into parts by identifying motives or causes. Students have to make inferences and find evidence to support their common areas. In addition to the teachers guidance, students maybe able to compile information together in a different way by combining elements in a new pattern or proposing alternative solutions. Finally, teachers can evaluate students by their present and defensive opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.

As it provides a poor experience for students browse blackboard website via mobile device, and Kindle Fire is a very expensive device and does not allow us to upload our e-book content, we need to develop our own e-book system in cloud computing platform.

3 Methodology

It is a good idea if the users can organize the discussion in the e-book system, they can apply what they have learnt. However, the e-books nowadays cannot provide that kind of function.

Our solution to the problem is to integrate the forum and cognitive map in e-book system and develop the system in cloud computing platform.

4 Prototype and Case Study

4.1 E-Book Open Forum

An open forum allows students to post their opinions and ideas after they read the books. These kind of postings are called message. A collection of messages on the same topic and related with each other become discussion. An open forum is hierarchical or tree-like in structure. [7] Depending on the forum's settings, users can be anonymous or have to register with the forum and then subsequently login in order to post messages. A posted message might need to be approved by the administrator of the system before it becomes visible. [7]

In our open forum, there is a default forum, named Public Forum. Teacher can login and then create different subjects. Subject is the topic teacher wish students to discuss. In each subject, the posting message called thread. During the discussion, user can choose to reply the subject or any thread. Therefore, each subject of the forum would be displayed hierarchically.

For every user-submitted message enclosed into a forum, it must contain the user's details, the date and the time it was submitted.

There are some advantages to include open forum in an e-book system:

- Open forum require the reader to visit the system and checks for new posts. As a result, users would not miss any replies in threads that they are interested in.
- There is no need for users to install additional software for discussion after reading a book.
- Even though all users can participate to edit the content of the forum, the level of content manipulation is reserved. For instance, only teacher can create the subject for discussion.
- Users do not have to be online to receive or send messages to participate the discussion simultaneously.

4.2 E-Book Cognitive Map

Cognitive Map will allow teaching staff and students participate in the discussion through the e-book system platform in a diagram format. After the teacher posts a topic in the map, students can create their own nodes to contain their ideas. Their nodes will be connected together. Students can share their idea towards the topic from different point of view. It is a kind of peer-to-peer learning. As a result, their knowledge is built through their suggestion as contribution.

Formalized cognitive maps are used in software design, where a common usage is Unified Modeling Language diagramming amongst similar conventions and development methodologies. [6]

Cognitive mapping can also be seen as a first step in ontology-building, and can also be used flexibly to represent formal argument. [6]

Cognitive maps can be widely used in education and business. Usages include: [6]

- Note taking and summarizing gleaning key concepts, their relationships and hierarchy from documents and source materials
- New knowledge creation: for example, transforming tacit knowledge into an organizational resource, mapping team knowledge
- Institutional knowledge preservation (retention), e.g., eliciting and mapping expert knowledge of employees prior to retirement
- Collaborative knowledge modeling and the transfer of expert knowledge
- Facilitating the creation of shared vision and shared understanding within a team or organization
- Instructional design: concept maps used as Ausubelian "advance organizers" which provides an initial conceptual frame for subsequent information and learning.
- Communicating complex ideas and arguments

4.3 E-Book Open Forum Implementation

We will develop the system by using Flex programming and the technology of Remote object (Remote_Obj).

Remote object is a Java class, which is saved on the web server. Clients can use this remote procedure by passing some parameters and get the result. Because this technology works on HTTP, all the packages can avoid the firewall restrictions.

In fact, it is very similar to web service. The difference is that remote object uses AMF (binary protocol) to transmit data and web service SOAP. Therefore, the performance of remote object is better than web service. That's why we choose this technology in this project.

Login is needed for both open forum and cognitive map implementation. It is because open forum and cognitive map of the e-book will be auto-synchronized every time when user login respectively.

Also, in the implementation, variable *user.text* stores user's text input. Whenever user creates a new text or a new node, Remote Object will automatically create an ID.

Therefore, 5 relational tables are created to store the e-book/open forum information as follows: [11]

ebookDB

ebookID	ebook	mapID
E001	Database	M001

ForumDB

ForumID	Forum Name
F001	Public Forum

SubjectDB

SubjectID	Subject	userID	ForumID	PostTime
S001	What are Database Topics?	Teacher1	F001	15:37

Fig. 3. Open forum of e-book

ThreadDB

ThreadID	SubjectID	Thread	PostTime	Connected Thread ID
T001	S001	Relational Algebra	15:41	S001
T002	S001	Data Modeling	15:49	S001
T003	S001	Database Recovery	15:55	S001
T004	S001	XML	15:59	S001
T005	S001	Data Normalization	16:02	S001
T006	S001	SQL	16:06	S001
T007	S001	Insert Statement	16:10	T006
T008	S001	Select Statement	16:10	T006
T009	S001	Physical Database	16:10	S001

userDB

<u>userID</u>	username	Identity
Teacher1	Mr J Fong	Teacher
Student1	K Wong	Student
Student2	Ann Wong	Student

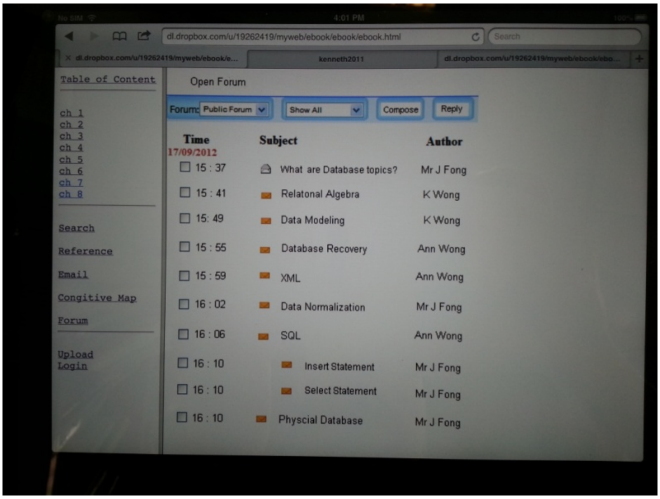

Fig. 3. *(Continued)*

```
[Teacher create a subject of open forum for a e-book]
Begin
        Login Open Forum via Remote Object;

        Select SubjectID, Subject from SubjectDB; \\ choose Subject

        if Subject not exist         \\create Subject via Remote Object;
        \\Remote_Object contain subject, user ID, Forum ID for every new subject
        {
                Create new Remote Object named Remote_Obj;

                Remote_Obj.subject = user.text; \\user.text stored the subject
                content
                \\user.text is the subject of the forum
                Insert into SubjectDB values (Remote_Obj.SubjectID, Re-
                mote_Obj.Subject, Remote_Obj.userID, Remote_Obj.ForumID,
                Remote_Obj.PostTime);

                save open forum in user's mobile device;
                auto-synchronized with the cloud system;

                return open forum;
        }
End;

[Student create a thread of open forum for a e-book]
[Remote_Object contain thread content, thread ID, and subject ID for every new
thread]
Begin
        Login Open Forum via Remote_Object;
        Select SubjectID, Subject from SubjectDB; \\ choose Subject

        if Subject=Null
                exit the Open Forum;
        else
                Remote_Obj.SubjectID  = SubjectID;

        Create new Remote Object named Remote_Obj;
        Create new Remote Object named Connect_Obj;

        if student want to reply the subject
        {
                Remote_Obj.thread = user.text; \\user.text stored the thread content
                Connect_Obj.threadID = user.SubjectID; \\ user.SubjectID stored
                which subject user replying
                // Connect_Obj contain information about the connected subject
```

```
        }
        if student want to reply the Thread
        {
                Remote_Obj.thread = user.text; \\user.text stored the thread content
                Connect_Obj.threadID = user.threadID; \\ user.threadID stored
                which thread user replying
                // Connect_Obj contain information about the connected thread
        }
                //make a connecting node via Remote Object
                Insert into ThreadDB values (ThreadID, Remote_Obj.subjectID,
                Remote_Obj.content , Remote_Obj. PostTime, Connect_Obj.
                ThreadID);

                save open forum in user's mobile device;
                auto-synchronized with the cloud system;
                return open forum;
End;
```

4.4 E-Book Cognitive Map Implementation

2 more relational tables are created to store the e-book/cognitive map information as follows:

MapDB

mapID	Topic
M001	Introduction to Database Cognitive Map

nodeDB

nodeID	Content	mapID	Connected nodeID
N001	Database Definition	M001	NULL
N002	Relational Algebra	M001	N001
N003	Data Modeling	M001	N001
N004	Database Recovery	M001	N001
N005	XML	M001	N002
N006	SQL	M001	N003
N007	Data Normalization	M001	N003
N008	Physical Database	M001	N003
N009	OODB	M001	N003
N010	Query Optimization	M001	N006
N011	5NF Definition	M001	N013
N012	Data Conversion	M001	N005
N012	Data Conversion	M001	N009
N013	5NF	M001	N007

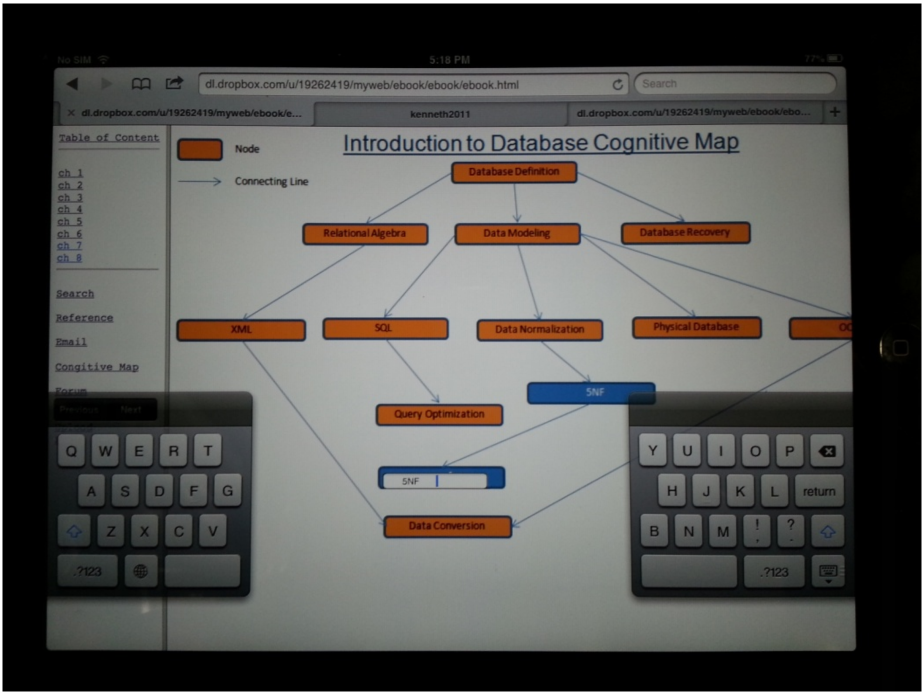

Fig. 4. Cognitive map of e-book

```
[Teacher create a cognitive map for a e-book]
Begin
        Login ebook system via Remote Object;
        Select mapID from MapDB; \\choose map

        if cognitive map not exist  \\create cognitive map via Remote Object;
        \\Remote_Object contain Topic and map ID for every new map
        {
                Create new Remote Object named Remote_Obj;

                Remote_Obj.content = user.text; \\user.text is the topic of the map
                Insert into MapDB values (Remote_Obj.mapID, Re-
                mote_Obj.content);

                save cognitive map in user's mobile device;
                auto-synchronized with the cloud system;
                return cognitive map;
        }
End;
```

```
[Student create a node for a e-book]
[Remote_Object contain node content, node ID, and map ID for every new node]
Begin
        Login ebook system via Remote_Object;
        Select ebookID, mapID from ebookDB; \\user select ebook

        Select Topic from MapDB \\user select topic
        if Topic=Null
                exit the cognitive map;
        else
                Remote_Obj.mapID  = mapID;

        Create new Remote Object named Remote_Obj;
        Create new Remote Object named Connect_Obj;

        if student want to add a new node connecting to the existing node
        {
                Remote_Obj.content = user.text; \\user.text stored the node content
                Connect_Obj.nodeID = user.nodeID;
                // Connect_Obj contain information about the connected node
        }
        if student want to create a new node without connecting to the existing node
        {
                Remote_Obj.content = user.text; \\user.text stored the node content
                Connect_Obj.nodeID =NULL;
        }
                //make a connecting node via Remote Object
                Insert into nodeDB values (nodeID, Remote_Obj.content , Con-
                nect_Obj.mapID, Connect_Obj.nodeID);

                save cognitive map in user's mobile device;
                auto-synchronized with the cloud system;
                return cognitive map;
End;
```

5 Conclusion

After teacher auto-generates a book file into e-book format, students can download and read it by their electronic device. This enables students save money to pay for the cost of lecture notes or other reference book material.

Using Cloud computing platform is the trend nowadays to develop client-server based system. It is very suitable to be the platform that we develop the e-book system. It is because more and more e-books will be imported to the system. The portability and expandability are very important for the system platform.

We will integrate the cognitive map features into the e-book system which aims at enhancing students' learning level. We expect students learn more from posting their idea through the node in cognitive map. Visualization of connecting idea can stimulate students to generate new knowledge. And we believe the user-friendly interface of cognitive map could aid students' creativity. We think our students reach application level or even analysis level after they learn from the e-book.

In conclusion, we will develop the e-book system, not only for students to reduce their learning cost, but more important, we want our students to learn at a more comprehensive level and encourage them apply new knowledge after using the e-book system.

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MOOCs: A Learning Journey

Two Continuing Education Practitioners Investigate and Compare cMOOC and xMOOC Learning Models and Experiences

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Abstract. MOOCs (Massive Open Online Courses) have been radically changing the direction of online education in the last few years. Although sharing many common features, there has been an emergence of two distinct varieties of MOOC: cMOOCs and xMOOCs. The two are distinguished based on their different pedagogies. This paper outlines the history of MOOCs and attempts to examine the main feature differences between cMOOC and xMOOC learning models. The authors, both continuing education practitioners, also present their experiences and reflections on being learners in a cMOOC and xMOOC delivered by Coursera, a commercial MOOC provider.

Keywords: MOOC, cMOOC, xMOOC, Connectivism, Connectivist, Coursera, Massive Open Online Course, E-learning, Online Education.

1 Introduction

In 1841, the inventor of the chalkboard was declared by Josiah F. Bumstead in his book The Blackboard in the Primary Schools, to be, "among the best contributors to learning and science, if not among the greatest benefactors to mankind" [1]. Education has always relied on tools, such as pencils, books, and chalkboards, to deliver content. Today, the list has grown to include Information and Communications Technology such as computers, and, more recently, online platforms such as MOOCs (Massive Open Online Courses).

2 Historical Context

The term MOOC was first used by Dave Cormier and Bryan Alexander to describe a course offered by the University of Manitoba in 2008 [2-4]. The course, CCK08: Connectivism and Connected Knowledge, delivered by George Siemens and Stephen Downes, attracted 24 fee-paying students on campus and over 2,200 non fee-paying students online [5]. As opposed to a traditional, large-scale, online, distance education course, such as those offered by the UK's Open University, MOOCs are usually free,

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 244–255, 2013.

open to all, do not assign students to supported tutor groups, are massive in scale and do not carry credit, although there is evidence that may be changing [6-9]. Centred upon the study of the Connectivist theory, the CCK08 course design reflected the title. Participants were encouraged to engage in, "networked learning and learning in distributed environments" [5].

3 Connectivism: A New Pedagogy?

Connectivism emerged as a possible adjunct to existing distance education theories. Cognitive-Behaviourism and Constructivism, including Social Constructivism, were the prevalent pedagogies used [10] until Siemens put forward his theory of Connectivism in 2004 suggesting that:

- *Learning and knowledge rests in diversity of opinions*
- *Learning is a process of connecting specialized nodes or information sources*
- *Learning may reside in non-human appliances*
- *Capacity to know more is more critical than what is currently known*
- *Nurturing and maintaining connections is needed to facilitate continual learning*
- *Ability to see connections between fields, ideas, and concepts is a core skill*
- *Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities*
- *Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.* [11]

Traditionally, learning has been accepted as the transfer of and accumulation of knowledge for the purpose of replication, in other words, *duplication*. However, the first generation of MOOCs was based on the theory of Connectivism. As such, the learning process itself was given greater emphasis, and knowledge *creation* was emphasized [12]. Consequently, the role of content shifted. In CCK11, the third cohort of Connectivism and Connected Knowledge, for example, Downes stated that none of the assigned materials were mandatory, and declared that, "in a connectivist course, *everything* is optional" [13].

Following this train of thought, one might conclude that such a MOOC may very well have no content at all. In response, Downes clarifies that although the course does not aim to teach specific content, it does not lack content; on the contrary, the course, and hence the learning potential of the participants, is not bound by or restricted to a specific body of knowledge. The Connectivist learning approach requires the individual's participation in the selection of content that they wish to study, and encourages the subsequent sharing of this content with other learners [14].

Other Connectivist-based MOOC courses have been offered on subjects such as Personal Learning Environments Networks and Knowledge [15], Digital Storytelling [16], Online Learning for Today ...and Tomorrow [17], Change in Formal Education Systems [18] and Learning Analytics [19].

4 Diverging MOOC Models: cMOOCs and xMOOCs

As MOOCs have proliferated, a clear separation has emerged of two distinct pedagogical MOOC models. The first category, which includes the MOOCs already discussed, is based upon the Connectivist approach. These are termed cMOOCs. The second category, although younger, is based upon an earlier pedagogy, the Cognitive-Behaviourist approach. The newer generation of MOOCs, xMOOCs, is sometimes also referred to as the Stanford MOOCs [20-22].

xMOOCs emerged in the fall of 2011 when Stanford University offered a free, online course in Artificial Intelligence as an experimental MOOC. 160,000 students from 190 countries registered for the course, and around 20,000 actually finished. Following the course, one of the course instructors, Sebastian Thrun, went on to found Udacity. Udacity led the pack of a number of start-up ventures providing MOOC platforms associated with top universities, which emerged in 2012 [21, 23]. Other such ventures to come into existence that same year included MITx, which later became Edx, and Coursera [24].

4.1 cMOOC and xMOOC Features

Although the characteristics of cMOOCs and xMOOCs cannot be rigidly defined, they have been found to differ in terms of the course content, assessment methods, roles of the instructors and students, and the interaction between them as well as their underlying pedagogies, as shown in Table 1.

Table 1. A Comparison of cMOOC and xMOOC Features [14, 21, 23, 25-28]

Features	cMOOC	xMOOC
Course Content	- “content does not define the course” [14] - exploratory in nature - select course materials are posted online as a starting point - students are encouraged to share and contribute to/extend materials and the collection	- content is specific and ‘packaged’; controlled - similar to traditional in-class approach - all course materials posted online

Table 1. *(Continued)*

Features	cMOOC	xMOOC
Interaction	- predominantly peer to peer [25]; monitored by instructors - encouraged to participate across decentralized forums and social media platforms [26]	- instructor feedback; peer feedback - discussion forums mostly centralized on course website
Assessment Methods	- formative - summative - instructor-graded - peer-graded [27]	- formative - summative - automated - peer-graded [27]
Instructor/Student Roles	- non-traditional: "distributed, chaotic, emergent" [27] - "learners expected to grow, create expand domain and share personal sense-making through artifact creation." [27] - autonomous learners [25]	- traditional: transfer of knowledge to learners; mastery/retrieval of knowledge by learners [26, 27]
Pedagogy	Connectivist	Cognitive-Behaviourist

5 MOOC Models: A Shifting Paradigm?

MOOCs are still a relatively new phenomenon and the expansion in the number of courses being offered since the start of 2012 has been rapid. It is expected that with time, there will also be further change in the MOOC teaching models and perhaps the current bifurcation between cMOOCs and xMOOCs may not be quite so distinct. Daniel speculates that Connectivists believe MOOCs will eventually shift back towards the cMOOC model [21]. However, Hill posits that, "the two current branches of MOOCs are different and will not merge - despite the common name, they have different aims and methods" [29]. Siemens acknowledges that MOOCs are still in an experimental phase and that as such there is a certain amount of fluidity in the teaching models [22].

There is some evidence of a shift occurring. The Massachusetts Institute of Technology (MIT), for example, has reportedly integrated some cMOOC elements into its MOOCs [21]. Further, in January 2013, on the Coursera platform, a course which ran in partnership with the University of Edinburgh broke with the traditional xMOOC model. Prior to launch, the course development team acknowledged that they were looking to experiment with existing MOOC formats [30].

6 A Comparison of Two MOOC Models: cMOOC and xMOOC

It is the Coursera-University of Edinburgh course, the E-learning and Digital Cultures (EDC-MOOC) course [31], which will be contrasted with another Coursera MOOC, Nutrition for Health Promotion and Disease Prevention (NHPDP-MOOC) [32]. Both MOOCs ran over approximately the same period of time. The two courses were undertaken by the authors of this paper, both continuing education practitioners who were also non-practitioners in the subjects they chose to study and, at the time of commencing their MOOC studies, online education novices. More detailed explanations as to why these particular MOOCs were selected will be provided at 7.1 and 7.2.

Both the Coursera MOOCs undertaken commenced in January 2013. At the end of Week One, it was indicated in course communications that over 40,000 students were enrolled on each course.

6.1 EDC-MOOC

Course Content. The EDC-MOOC was a five-week course inspired by a longer, online, Masters level, credit course also titled ‘E-learning and Digital Cultures’, offered in the University of Edinburgh’s MSc in Digital Education program.

Following registration in November 2012, the EDC-MOOC instructor panel sent an email as an introduction and welcome to the course, encouraging pre-course networking on social media prior to the January start date.

The course itself followed the cMOOC model. Weekly materials consisted of short YouTube/Vimeo clips and articles. Extra readings were suggested for those interested in more in-depth directed learning. Throughout the EDC-MOOC no formal lecture-based content was delivered by any means.

Interaction. Participation was strongly and consistently encouraged throughout the MOOC, the purpose being to share thoughts, experiences, insights, feedback, and supplementary materials as a response to assigned course materials. Social media, in particular, played a significant role: Twitter, Flickr, YouTube, Synchtube (note: closed as of March 15, 2013), Facebook, and blogs (WordPress and/or Blogger were suggested as possible platforms). Meetups were suggested for more social local gatherings and/or in-person study groups.

A panel of five course instructors, comprising two senior lecturers, two lecturers, and one PhD student, all of whom were on the program team for the University of Edinburgh’s MSc in Digital Education program, facilitated the EDC-MOOC. Emails were sent by the panel to the participants to guide their study on a weekly basis. Additionally, two Google hangouts were organized, one at the end of Week One, and the other at the end of Week Three. Each hour-long hangout was hosted by the panel, who responded to content-related comments and questions brought up during the week or tweeted/emailed in during the hangout.

Week Two saw the participation of eight University of Edinburgh MSc in Digital Education students as teaching assistants (TAs). They were all taking the longer, Masters level, credit course entitled ‘E-learning and Digital Cultures’ in the MSc program. It is not known whether they participated in the EDC-MOOC for credit, but, in their TA role, they responded to the online contributions of the Coursera students that week.

Assessment. There was one mandatory assignment for the course, due in Week Five. Participants were to create a digital artifact in response to the course, and could explore any of the broad range of topics covered by the EDC-MOOC. The artifact was to contain a mixture of two of the following: text, image, sound, video, links. Participants were then required to peer-grade a minimum of three other students’ artifacts, giving both quantitative and qualitative feedback on each.

Instructor/Student Roles. Throughout the course the five course instructors were evident mainly as facilitators and monitors in the social media and discussion forums, with eight teaching assistants joining them for Week Two. During the Google hangouts all five instructors participated and one of the instructors acted as a lead facilitator. The weekly email was sent out by the team and they were also involved with the monitoring of the assessment process.

Pedagogy. The MOOC was clearly cMOOC in nature and based on a Connectivist pedagogy. Exploration and the establishment of one’s own decentralized network were key features of the learning model.

6.2 NHPDP-MOOC

Course Content. The NHPDP-MOOC course was a six-week course delivered by Coursera’s partner, the University of California, San Francisco. The course followed what is considered to be the traditional Coursera xMOOC model. That is, using video-based lectures to transfer content. Most of the lectures were short in length, between five and fifteen minutes, and took the format of a lecturer narrating PowerPoint slides. Towards the second half of the course, guest lecturers were invited to participate, and these videos were conducted as either interviews or lectures. Supplementary links to websites related to the lecture content were also provided.

Interaction. Participants were guided through weekly course tasks via regular weekly emails, and, in some weeks, a short course-update video was also provided. A centralized online forum was located on the course site to encourage course-related discussion. Although there was interaction and discussion on the forum, and some reference made to this in the course updates, non-participation would not have altered the ability to successfully complete the course.

Assessment. Assessment focused on testing the acquisition of the knowledge gained via the lectures using video-embedded questions, weekly quizzes and three peer-graded assignments. The assignments involved the participant in undertaking a personal task then using an online tool to conduct a nutritional analysis and uploading the results. Finally, a series of short answer questions were asked. These tasks were each peer-graded according to a three-scale numerical marking scheme. No substantive qualitative feedback was provided for any of the tasks. For each assignment, participants were also asked to peer-grade a minimum of three other students' assignments.

Instructor/Student Roles. Throughout the course the instructor was instrumental in instructing and acting as a facilitator by guiding participants through the course materials. She and her teaching assistant staff also monitored the discussion forums, sent out weekly communications and were also involved with the monitoring of the assessment process.

Pedagogy. The pedagogy used can be classified as Cognitive-Behaviourist based on the linear structure of the MOOC and the presentation of the material with the focus on retrieval of knowledge. In this way, the MOOC conformed to a very traditional xMOOC model, as expected.

7 Reflections Upon the MOOC Learning Experience

In undertaking these two courses, the authors set out with differing learning objectives and expectations. Both faced challenges on the way, some caused by their own circumstances while undertaking their course and some due to the nature of their chosen MOOC. What follows is a reflection upon these experiences and each practitioner's view on their learning journey.

7.1 EDC-MOOC

Reasons For Selection. Having experienced a time when telegrams were the fastest mode of correspondence, and now teaching in an era where making a video call to someone on the other side of the globe is common-place, the author who took the EDC-MOOC had come to a realization that in order to keep pace with her 21st century learners, it was necessary to understand and attempt to embrace the concept of online learning. The author, therefore, decided to undertake an online course in order to learn about the world of e-learning first hand. Having first considered a number of different courses offered by Coursera based on the fact they were online and free, the EDC-MOOC was selected as it also focused specifically on the subject of e-learning.

Expectations. For someone with little prior experience with online learning but with familiarity of traditional education practices, there was an expectation to be explicitly taught, shown, and guided through the typical reading of articles and writing of responses.

These expectations were shattered when pre-course instructions were received for students to network with fellow course participants via social media channels so as to build an online community to facilitate learning.

Challenges. An immediate challenge faced upon commencing the EDC-MOOC was to overcome a long-time personal reluctance to establish an online presence. This was followed by concerns of not having anything to contribute to online discussions or finding the time to spend online to surf, read blogs and social media posts, assimilate information, and respond. In addition, the confusion caused by working towards a single global deadline led to actually missing one.

Learning Evaluation. Overall, although the course materials were thought-provoking and insightful, it was the methodology, different from the expected traditional or Cognitive-Behaviourist approach as it was, that left a deeper impression. As a typical cMOOC, EDC-MOOC provided the author taking this course with what felt to be uncustomary autonomy over their level of involvement and goal setting. It eventually became clear that there was no rigid standard to meet, no style to conform to, and no common objective to achieve. Nevertheless, learning was evident: EDC-MOOC had successfully served its purpose as a first step into the world of e-learning. With a little more guidance, however, more could perhaps have been accomplished.

7.2 NHPDP-MOOC

Reasons for Selection. The NHPDP-MOOC course was selected in order to provide a basic understanding of the subject in the hope that it would have personal relevance and stimulate lifestyle change rather than further academic goals. The decision to take a MOOC instead of a classroom-based or traditional online distance learning course was made on the basis that the Coursera MOOC was free, online, short in length, globally-accessible and appeared to cover the relevant subject areas but would not require too much commitment given that the participant would be travelling overseas on business for much of the course duration.

Expectations. Expectations of the course were that it would deliver video-based lectures and that knowledge of this material would then be tested; in other words, the learner would be shown and then expected to demonstrate mastery of the subject in a Cognitive-Behaviourist fashion.

The course delivered on expectations and was very structured in its approach with each video, week and assignment following what appeared to be a fairly rigid formula. This gave a sense of security to the learner but also provided a certain amount of predictability. Frequently, the lack of variety led to boredom and loss of focus on the subject matter.

There was a definite feeling of one-way communication - a sense of push from the instructor and little sense of pull in terms of welcoming feedback. Although there was a centralized discussion board on the site, the author undertaking the NHPDP-MOOC did not participate in it and did not feel the learning experience suffered because of this.

Challenges. A few interesting challenges arose due to the nature of travelling overseas on business. Timezone issues posed a problem and meant that less time was available to complete tasks and assignments. Also, being a nutrition course, part of one of the assignments was to cook a meal. This was not possible when staying in hotels.

Learning Evaluation. Overall, the NHPDP-MOOC was passive and repetitive. The level of engagement compared to previously undertaken classroom-based continuing education courses was very low, and thus motivation, attention, and retention levels were also considered to be lower. This was perhaps due to a lack of involvement, flexibility, and autonomy in the learning process. Learning did occur, but there was a feeling that more could have achieved in different circumstances.

8 Discussion

Both authors felt that they had, indeed, been successful in achieving their learning objectives. However, they also felt that their learning experiences would have been enhanced had their respective MOOCs been more like the other in approach i.e. if the cMOOC had been more like the xMOOC and the xMOOC more like the cMOOC. So perhaps if a way for greater integration of the two current cMOOC and xMOOC models can be found, as the team from the University of Edinburgh hope [30], this may produce a third generation MOOC model to be examined at a later date.

For course developers and continuing education practitioners, a modification of this magnitude in course delivery and teaching methodology would necessitate a significant change in the course development process. Rather than simply remodeling offline courses into online variations as a quick response to the rising popularity of e-learning, perhaps the time is upon us to consider whether we need to revolutionize the courses we place online. This would require course developers and practitioners to acquire a new set of skills or to collaborate with those who already possess the desired technical expertise [21].

In the meantime, it is recommended that prospective MOOC participants factor in whether a cMOOC or xMOOC or other variant of MOOC pedagogy is being utilized alongside other course-selection variables such as content, provider, fee, accreditation, load, and how this fits with their own learning preferences and goals. At the end of the day, whether or not a course is free, a learner is still investing time and energy into the learning process.

9 Conclusion

In Cormier's video, "What is a MOOC?" he concludes by saying that, "Only you can tell, in the end, if you have been successful" [33]. The authors in this particular study certainly recognize that for them, the MOOC journey in itself, which commenced with the Coursera MOOCs and has resulted in this paper but may yet lead elsewhere, has been more important than the anticipated destination.

The world of MOOCs is certainly changing rapidly, and more research studies need to be conducted into the effectiveness of MOOCs as they evolve from being possibly considered "ed-tech du jour" [21, 30] into a more widely-accepted learning environment.

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E-Learning Privacy: Perceptions of East Asian Students

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Abstract. This research investigates East Asian students' perceptions towards e-learning privacy. The survey was first carried out in Japan (N1= 255) and China (N2=307) in 2009. In 2012 the same survey was conducted again in these two countries but with different participants (N3=175, N4=63). To survey in different countries is to verify whether e-learning privacy perceptions have cultural factors. To conduct the same survey with a three-year interval is to verify whether e-learning privacy perceptions change over time. Actual registered private information on two e-learning systems is analyzed, too in order to confirm the findings in the survey. The findings are: while students are indeed concerned about their private information being online, they support their teachers collecting and using their private information for learning purposes. East Asian students consider personal photo, mobile phone number, and physical address to be very private and are reluctant to register these items even in e-learning systems.

Keywords: e-learning, privacy perceptions, art and language education, e-learning system design.

1 Introduction

E-learning has been widely practiced in world educational institutions, western or East Asian. In Japan, as early as 2007, 75.8% of universities employed one or more e-learning systems and 79.6% of universities integrated e-learning into their face-to-face teaching [1]. In China, 87.2% of national key universities have purchased commercial e-learning systems or built up their own [2]. E-learning has become a common concept for both students and teachers.

E-learning research has witnessed a great development, too. Numerous publications are now available academically. However, most of such research papers focus on technology, strategies and students' learning gains. Very little research looks at the issues of how online privacy discourse affects students' online-learning motivation. In this paper, the authors will address the following issues:

(1) How much are East Asian students concerned about their e-learning privacy and what types of e-learning private information are they concerned about most?

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 256–268, 2013.

(2) What are students' perceptions toward online private information collection and monitoring by their teachers for learning purposes?

(3) Do students in different countries have different perceptions on their online private information and are these perceptions changing over time?

2 Method

2.1 Participants

For the purpose of verifying if students' perceptions of e-learning privacy vary over time and country regions, surveys were carried out in two East Asian countries: Japan and China - during April 2009, and July 2012. Totally 800 students took part in the surveys. All participants were familiar with studying in one or more e-learning environments. There is no big gap in participants' ages.

Table 1. Participants of e-learning privacy survey

Survey year	**Country**	**Number of participants**			**Average age**	**Surveyed universities**
		Male	Female	Total		
2009	Japan	151	104	255	19.1 (SD=2.7)	Hiroshima Shudo University, Yamaguchi University
2009	China	83	224	307	21.3 (SD=3.3)	Yangzhou University, Shandong University of Chinese Traditional Medicine, The Open University of Nantong City, Ningbo University of Technology, Jiangnan University
2012	Japan	120	55	175	20.2 (SD=0.8)	Shimane University
2012	China	43	20	63	20.7 (SD=2.12)	Anhui Jianzhu University

Aside from the above questionnaire, the investigation on user registration information from Moodle – a popular open-source LMS and another e-learning program called InterCussion was conducted in 2013 by one of the authors in Japan. Profiles of 152 users on Moodle and 109 registers on InterCussion were examined.

2.2 Data Collection

The survey conducted in 2009 were in paper-and-pencil format. The printed questionnaire was distributed in class by the teachers and collected in class when it was answered. Completed questionnaire sheets collected from 5 different universities in China were posted to Japan for manual transcribing. The survey in 2012 was carried out online. Students were asked to access the survey URL and finish the questionnaire online. On Japan side, students filled in the questionnaire in PC classrooms with their teacher in class. On China side, the survey URL was sent to 78 students by email. And 63 students responded within a one week duration. As the survey was answered at ones' own volition for Chinese students, it was designed to refuse repeated submission from the same IP address.

When survey data was gathered and analyzed, one author in Japan accessed Moodle and InterCussion as a system administrator role to analyze real registered users' profile information.

3 Results

3.1 Survey Results

The questionnaire consisted of 8 questions and a request to give one free comment (See Appendix or the URL of https://ix1.inter-scc.jp/ic/e?i=TBp0Ag1K8Hk). The first question gathered demographic data such as the participants' gender, age and grade level. Questions 2-8 elicited participants' perceptions and attitudes to e-learning privacy disclosure. These questions (2-8) can be grouped into the following three categories:

(1) Questions investigating participants' self-assessment of their knowledge of privacy protection laws (Question: 2)
(2) Questions investigating participant attitudes toward the current use of their private information by their teachers (Questions: 3, 6, & 7).
(3) Questions investigating the degree of participants' concerns over specific items of private information (Questions: 4, 5, 8).

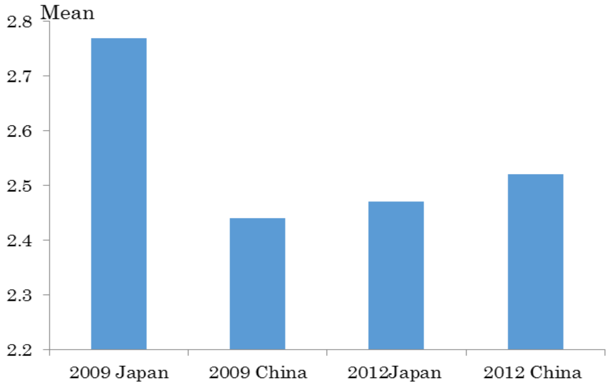

Fig. 1. Students' self-assessment on privacy protection law knowledge (5: Very familiar; 1: Don't know at all)

Most of countries in the world have promulgated laws to protect people's privacy [3]. However, in different countries, people's understanding and recognition of the laws may be different. Question 2 asks students in Japan and China to self-rank their knowledge toward privacy protection laws. See Fig.1 below.

The data shows that students in both countries are aware of the existence of privacy protection laws, but are not very confident with their knowledge on the laws.

In 2009, Japanese students self-ranked higher than Chinese students, and in 2012, the result reversed. However, both differences are not statistically significant according to *t*-test ($t(560)=1.423$, $p<.05$, $t(368)=0.190$, $p<.05$).

Students' attitude toward teachers' collection of their online registration information as well as learning information are the very factors that this study tries to delineate. If students are too much fearful of their online private information being stolen, leaked or sold to a third party they will not be willing to join any e-learning program or actively involve in any online-learning activities. Therefore, it is not overstating to say that online privacy issues are one of the keys for a successful e-learning project [4]. The data in terms of students' attitude towards email address collection, online-learning monitoring, as well as their concerns of private data leakage are shown as follows.

The graph clearly shows that in general students in both countries support their teachers' collection of their email addresses, and understand and trust their teachers' monitoring their learning history and learning preferences on e-learning systems. However, degrees of support and understanding are different. Japanese students are more supportive of letting their teachers use their private data while Chinese students are more cautious. (Online monitoring: $t(560)=5.54$, $p<.05$; Concerns of private data leakage: $t(560)=5.88$, $p<.05$). Statistically, there is no difference between the attitude of Chinese students and Japanese students toward email address collection by their teachers. Difference between data in 2009 and 2012 is not significant, either.

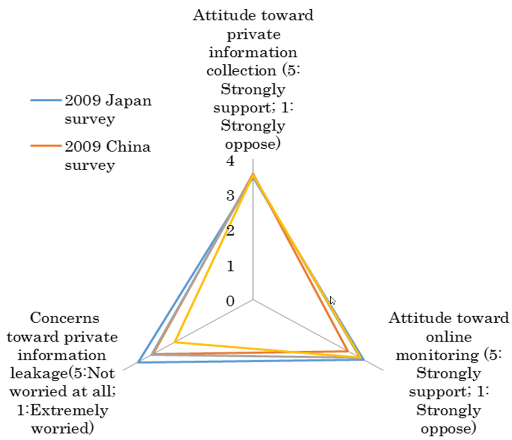

Fig. 2. Students' perception of their e-learning privacy

Question 4 asked about what communication tool, PC email or mobile phone email/Short Message Service (SMS), that students preferred to use for contacting and being conducted in terms of e-learning matters. The result shows in the following graph.

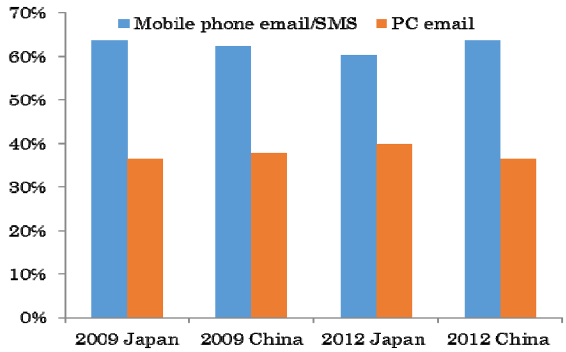

Fig. 3. Students' preferred email tool for e-learning communication

The data implies that majority students both in Japan and China preferred to use mobile phone for message communication in e-learning. And these preferences did not change with passing time.

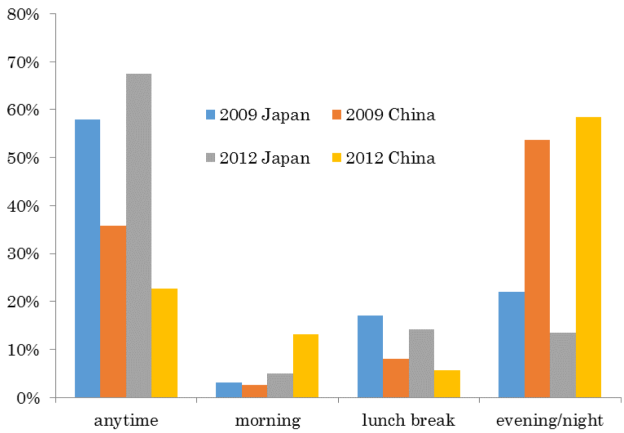

Fig. 4. Student preferred time to be contacted

Question 5 investigated students' preferred time for being contacted via mobile phone. The data shows more than half of Japanese students (58% in 2009 and 67% in 2012) think they can be contacted at any time. Chinese students (54% in 2009 and 58% in 2012) preferred evenings or night for e-learning contact. A very small percentage of Chinese students regard lunch time as a good time for contact. See Fig. 4.

The purpose of Question 8 is to find out when students register with an e-learning system what type of private information they are most reluctant to share. The results show that regardless of regions, 2012 or 2009, the private information that students are most reluctant to disclose is personal photos, mobile phone numbers, and physical address. The data further indicates that Japanese students (51% in 2009 and 45% in 2012) regard personal photo as the top sensitive information and they do not want to upload to e-learning systems. While Chinese students (35% in 2009 and 32% in 2012) think their mobile phone number is the private information that they are most cautious to disclose. The other sensitive private information and less sensitive private information are also shown in Figure 5. There is no statistical significance between the student participants in the same country in 2009 and in 2012, which means no change over time can be seen in students' perception towards what is sensitive private information.

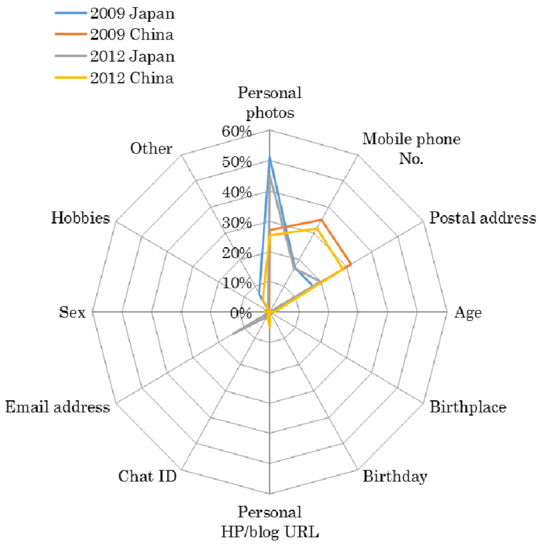

Fig. 5. What type of private information are students most cautious about?

For most of survey items participants are encouraged to write down reasons for their answer. And the final item of the survey is to ask participants' general comments on e-learning privacy. These comments directly from learners provide the first hand source to expound the survey outcomes. The Discussion part will look closely into students' written feedback.

3.2 Registration Results in E-Learning Systems

Three of the surveys were administered in classrooms with teachers in class. Students answered the questionnaires, either by paper- and- pencil or online, then turned them in to the teachers. The existence of teachers could give students a certain kind of pressure so that students may "positively" rank their attitude regarding survey items in which teachers seemed to be involved [5]. Thus, in order to confirm the results obtained in the subjective surveys, the objective registration data in e-learning systems is gathered. We first investigated students' registration information on an email magazine project performed in 2012 which aimed at improving students' English reading ability. Among the 109 students who registered at their own volition, 72 (66%) registered with their mobile phone email addresses, and only 32 (34%) registered with their PC email address. This result conformed with what was discovered in previous surveys: mobile phone email address is preferred for e-learning contact.

Moodle's "edit profile" module provides many fields for users to share their private information. Figure 6 and Figure 7. One author investigated profiles of 152 registers as a Moodle administrator. He discovered that all of the students registered their real names, cities, countries. Regarding email addresses, as they were told that Moodle is mainly a PC-oriented LMS, all of them registered with PC email addresses. Nobody uploaded their personal photos or registered any other private information.

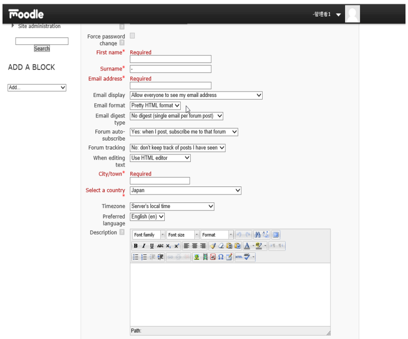

Fig. 6. Moodle use profile page (a)

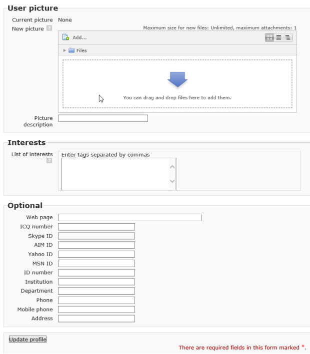

Fig. 7. Moodle Moodle use profile page (b)

4 Discussion

Personal information/privacy protection is an ongoing concern in our information society. The majority of countries in the world have drafted laws to protect its peoples' personal information/privacy from intrusion. In e-learning, learner concerns over the security of their personal information/privacy heavily influence a learner's willingness to disclose information on themselves in online activities. The more learners are concerned about the security of their online private information, the less they will disclose about themselves [6]. Teachers cannot force or pressure students to provide personal information even for learning purposes. However, when an e-learning teacher better knows the personal information/privacy concerns of their students, they will be better able to decide what information to collect and how it should be used. Teachers can feel more secure collecting information that students are willing to divulge than information learners are hesitant to disseminate. Not only should teachers be familiar with personal information protection laws, they should also ask what concerns their learners have about e-learning privacy and personal data disclosure.

In Japan the Act on the Protection of Personal Information [7] is strictly enforced and widely publicized. In China there has not been a special private protection law so far, however, privacy protection is formulated within other laws, such as the China Civil Law. In recent years, China has witnessed a breath-taking development in Internet use and now has the most Internet users in the world [8]. Online privacy has become a daily topic for ordinary Chinese people. Further, in both countries, cyber-crimes are often reported in the news. This makes online privacy concern deeply-rooted among the citizens. However, being aware of the existence of privacy laws does not mean students have read and understand details of the laws or use the laws to protect their cyber interest. This may explain why students in both countries did not rank their knowledge of the law very highly.

Since university students claim to have some degree of knowledge of privacy laws, e-learning teachers too should undoubtedly also read concerning private information/privacy law provisions, and/or attend their institution's training seminars regarding the laws, in order to be equipped with enough legal knowledge to address issues of private data disclosure in e-learning.

Email is still the most commonly used private information for exchanging e-learning content [9]. Thus collecting email addresses is very common in an e-learning class. In some e-learning systems, like Moodle, email based registration is a must. The surveys we carried out in Japan and China show that learners in both countries, to a large degree, support email address collection and see it as a necessary, or at least as a "have-to" requirement. For the sake of convenience, the majority of young students prefer to use mobile phone to receive messages from teachers. This is because mobile phone is a carry-on tool and can deal with any urgent task anytime, anywhere. In Japan, almost all mobile phones are internet-connected and every mobile has a unique email address. In China, mobile phone email is not recommended by telecommunication contractors, but SMS is always available at good service. As smart phone has now rapidly become the norm for a progression of university students, Yahoo email, Gmail and Hotmail - which were regarded as PC email accounts - are now also checkable at fingertip.

Nevertheless, one Japanese survey participant commented:

> For class announcement or short, text e-learning materials, I would like to receive on mobile phones, but for a big chunk of materials, please send to my PC email address.

This comment reminds teachers of the fact that the mobile phone is an ideal tool for message communication, but not good for heavy e-learning tasks.

Besides positive attitude toward email collection, students in both countries also understand teachers' online monitoring on their learning progress. One Chinese participant commented:

> I don't feel comfortable when I realize that my leaning is being watched by teachers. However, without "spying" on us, our teacher would not know how well or how poorly we are doing online. Monitoring or even tracing our learning history is acceptable to me as it is for learning purpose.

Students are cautious about their online private information, but are not worried about their private data being leaked to a third party. Two students' comments may backup this confidence:

> I am not worried at all about our private information stored in e-learning systems. First of all, I trust our teachers can safely handle our private information in a secure way. Second, if by any chance, the system is hacked, who want to buy our learning information? Our credit number is not there! (20 year-old first year Chinese boy student)

> I think the security of our e-learning system is tight. And I don't think our teachers will neither "sell" nor "tell" our private information to other people. It is not worth anything. (19 year-old first year Japanese girl student)

Interestingly, either in 2009 or 2012, Chinese students were found to be less forgiving than Japanese students in terms of online monitoring and online-learning security. The reason for this might be due to the factor that in China e-learning is mainly used for degree education [10] and is not integrated to general high education as widely as in Japan. And Internet security is not receiving the same attention as in Japan. Five Chinese students commented in 2009 survey that they have experienced email virus or fraud calls to their mobile phones.

Chinese students and Japanese students differ in preferred time being contacted via mobile phone. Most Chinese students take a nap at noon. Therefore the lunch break is not considered to be a good time for any learning task. They feel relaxed and have most free time in the evening or at night. Evenings or night is the best time to contact student's' mobile phone. While for Japanese students, most of them do not sleep at noon and they tend to place their mobile phones on manner mode whenever they are busy. This explains why the majority of Japanese students think they can be contacted "anytime".

Neither Japanese nor Chinese university students consider age, personal URLs, birthplace, chat-ID (Instant Messenger ID), and email address to be very sensitive; whereas they are very concerned about uploading their personal photos, telephone numbers and physical addresses. The top sensitive private information for Japanese students is personal photos while Chinese students regard mobile phone numbers as the most sensitive. The reason for this difference remains unclear to the authors and needs to be probed from cultural, social and economic points of view.

Students can control the content of their blogs and home pages. Similarly their chat-ID and e-mails can contain as much, or as little, self-revealing content as the student wishes (for example, you can give yourself any "name" you wish in your e-mail). However, students cannot control the information contained in their facial photos, home addresses or telephone numbers [11]. One obvious recommendation therefore is that e-learning teachers in Japan and China avoid collecting or encouraging registration of students' facial photos, telephone numbers, and postal addresses. Regardless of the type of private information being collected from students, e-learning teachers should always make clear the reasons they collect private information from students, and always allow the students to refuse. When using private information, teachers must notify the learners. If personal student information is to be provided to a third party: for example, to another e-learning teacher - this requires consent from the individual student/s. Finally, when learners request modification of their personal information, the request has to be met (Japan Personal Information Act, Chapter 4, Article 18).

5 Conclusion

Perceptive data from the surveys coupled with objective data from actual in-use e-learning systems is carefully analyzed in this study. The findings show that learners in both China and Japan have positive attitudes toward private/personal data collection by their teachers if for learning purposes, although they did express concerns about some particular privacy items, such as personal photos, postal addresses and phone numbers. Japanese students are the most cautious with uploading of personal photos, while Chinese students are most reluctant to give out their mobile phone numbers. When having options, students in both countries choose to use mobile phones for message communication unless the message contains a large size of attachment. Although learning messages can be sent to Japanese students' mobile phones at any time; for Chinese students, evenings or night is the most ideal time for them to read and respond. Lunch time is fine for Japanese students, but should be avoided for Chinese students, as most Chinese take a nap after lunch.

There is no statistical significance found to imply that students in the same country perceive e-learning privacy differently from what they did three years previously.

By looking into the registration information in two e-learning systems, the above findings obtained from surveys were confirmed. E-learning privacy concerns prevent students from sharing any further information other than required items even with their teachers and cohorts.

The findings via this research indicate that teachers should collect as little personal information as possible. If really necessary, teachers should take into account that students are more concerned with some aspects of their privacy than others, and therefore teachers should do their best to find out which information their learners are apprehensive about providing. For the e-learning system designers, they should take the findings in this paper into account and design a system that is both effective and privacy risk-free.

6 Research Limitations

While asserting East Asia, the surveys were only conducted in Japan and China. Certainly, Japan and China are important East Asian countries; however another advanced country in e-learning, Korea, is not concluded in this research. This could heavily lower the research reliability as a research from "East Asia". Further, on Japan side, this research only surveyed Japanese learners of English. On China side, this research mainly surveyed students majoring in English language or art. And analysis on actual e-learning registration was not performed in China as such an investigation needs a system administrator account. The results may display limitations unique to the region and learners of foreign languages and art; the same questions posed to learners in Korea and other academic disciplines might yield different responses.

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Appendix: A Survey on personal data disclosure

1. Which year are you currently in?
   1) first year 2) second year 3) third year 4) fourth year 5) fifth year
   6) sixth year 7) graduate student
   Sex 1)male 2)female
   Age______

2. Are you familiar with the Protection of Personal Information Act of Japan/ privacy protection laws in China?
   5 4 3 2 1
   Very familiar ☐ ☐ ☐ ☐ ☐ Don't know at all

3. What is your attitude toward teachers asking for private information such as your e-mail address?
   5 4 3 2 1
   Strongly support ☐ ☐ ☐ ☐ ☐ Strongly oppose
   Reason ( )

4. Do you prefer to be contacted through your mobile e-mail address/SMS or your PC e-mail address?
   1) Mobile phone e-mail 2) PC e-mail 3) either one is fine
   Reason ( )

5. Considering your own privacy, which part of the day do you prefer course-related material to be sent to your mobile phone?
   1) morning 2) lunch break 3) evening /night 4) any time
   Other time ( )
   Reason ( )

6. In e-learning, some of your online activities, such as your login time, learning history, and learning preferences will be recorded and monitored. What do you think of this?
   Strongly support. 5 4 3 2 1 Strongly oppose.
   ☐ ☐ ☐ ☐ ☐
   Reason ( )

7. Are you worried that the personal data stored in your e-leaning program will be stolen or passed on to a third party by your teacher?
   5 4 3 2 1
   Not worried at all ☐ ☐ ☐ ☐ ☐ Extremely worried

8. When you register your personal information with an e-learning program, which of the following personal items are you most reluctant to release?
   1) e-mail address 2) mobile phone number 3) birthplace 4) age 5) address 6) photo 7) personal homepage/ blog site 8) chat ID (Instant Messenger ID) 9) other ( )

9. Feel free to write down your comments on the issues regarding e-learning and personal data use and protection.

Students' Experience and Perception on E-Learning Using Social Networking

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Abstract. The growth and popularity of Web 2.0 applications have a profound impact in the way people communicate and connect with one another. Social Networking (SN) provides people with multiple ways to connect, share experiences and insights, and engage with one another. At present, people make use of social networking to make new friends, maintain friendship and interact with them. It can, at the same time, be an ideal platform for online learning community with great potential to facilitate students' learning. On the other hand, more and more higher education institutes are integrating e-learning systems into their standard pedagogy. In this paper, we will present findings from a small scale study exploring the first year students' experiences on social networking usage and their perception on using it for e-learning. The data are collected quantitatively, consisting of surveys on students' experiences on using social networking as a communication and collaboration tool. The results are to be used for the preparation of a larger survey for the whole institute. The preliminary findings indicate that students are inclined to utilize social networking for performing many learning tasks. If teachers can design some learning activities conducting on social networking and cooperated with Learning Management System (LMS); it may effectively promote online community and enhance collaborative learning amongst students.

Keywords: Social networking, Facebook, e-learning strategy, community building, collaborative learning.

1 Introduction

Technology has become inseparable with our daily life. Indeed, the growing demands of Web 2.0 applications have profound impact in the way people communicate and connect with one another. Social networking activities such as chatting with friends and sharing information are very popular. In fact, social networking technology facilitates information sharing, interaction and collaboration among its users. Many students are spending a lot of time and heavily immersed in social networking sites, such as Facebook [1]. Facebook is a popular social networking site with over 1000 million active users around the world in September 2012 [2]. A recent statistics report on Facebook [3] indicates that there are about 3.7 million Facebook users in

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 269–279, 2013.

Hong Kong. Since the population of Hong Kong is around seven millions, which means half of the population in Hong Kong are Facebook users. Although the primary purpose of social networking is to provide an online communication platform for people to communicate and interact with each other [4], it can also foster online communities for students to work together and thus it could be an effective collaborative learning tool. As researchers, we are interested in all possible variables and factors that influence our students' learning activities in this online learning environment. A small scale pilot survey was conducted to collect preliminary data; the result would be prepared for a larger survey on the whole institute. In this paper, we aim to gather first year students' experiences on social networking usage and their perception on using it for e-learning. The data were collected quantitatively, consisting of surveys on students' experiences on using social networking as a communication and collaboration tool. Since the study is still ongoing, the findings we have obtained are preliminary and from limited data.

2 Social Networking

During the last ten years, social networks have made an evolution of communication among people, from simple communication to online community. Social networking sites are web-based platforms where people can create individual public profiles, interact with real-life friends, and meet other people based on shared interests [5]. It is designed for social interaction purposes. Social networking sites have been around since the mid-90's, but in recent years, social networking sites has exploded across the Web [6]. Social networking sites allow users to share ideas, pictures, posts, activities, events, and interests with people in their social networks. Currently, the popular social networking sites include Facebook, Twitter, LinkedIn, MySpace, Google+, etc. According to the statistic report from eBizMBA in April 2013 [7], Facebook becomes the largest social networking site in the world.

According to Facebook's quarterly earnings report released in May 2013 [8], it had 665 million Facebook active users each day on average, 1.11 billion Facebook active users each month, and 751 million using Facebook from a mobile device each month. These figures show the pervasiveness of Facebook around the world. Indeed, social networking sites, such as Facebook, appear to play an important role in the process for people to form and maintain an online community.

3 Social Networking in Education

Social networking has certainly great potential in promoting collaborative learning because of its interactive features which are very suitable for collaboration and knowledge sharing among students on the Web. Its application in education may be used to build and promote virtual learning community. According to Social Learning Theory [9], people's learning takes place as individuals abstract information from observing behaviors of others. People learn from one another, via observation, imitation, and modeling. On the other hand, Lave & Wenger [10] proposed Situated Learning

Theory and Community of Practice (COP). COP is a group of people who share a common interest and a desire to learn from and contribute to the community with their variety of experiences. A COP tends to encourage every member to take responsibility to contribute their knowledge and exchange information, to develop their personal identities in the community, and to foster unification of the community.

In fact, social networking can fulfill various functions of Social Learning and Community of Practice. Through the community of social networking, students can enhance their personal and social development, such as building relationship with friends, learning new knowledge, and understanding different points of view from other like-minded peers. As social networking is built to provide a virtual interactive environment, teachers can use social networking to develop student abilities in team building. Other studies claimed that Facebook could effectively support collaborative learning and potentially support student learning and peer networking [11][12]. Another research showed that students were felt “comfortable” with teachers on Facebook and wanted regular online discussions with teachers [13]. Since many social networking sites are free and open to the public, they allow users to make comments, post messages, upload photos and sharing resources. Teachers may through social networking technology lead discussion by posting questions or comments, share viewpoints, and encourage students to discuss issues and express their concerns. Students can collaborate with others to establish a particular topic of mutual interest. More specifically, social networking technology has many features that people may use to share their mutual interests and to collaboratively set objectives, regulations, and formats. In addition, social networking features are very suitable for encouraging collaboration and sharing knowledge among students on the Web. It is beyond doubt that its application on the blended learning has a promising future.

4 Research Settings

This research was conducted in the fall semester of 2012-13 academic year. The first group of students who were pursuing post-secondary programme in the Institute was invited to conduct a survey. For this research, we assume that the first year students have less biased experience in e-learning towards our learning management system. Moreover, the research results are to be used for the preparation of a larger survey for the whole institute. The result from the larger survey may influence the e-learning policy of our institute in future. Thus, it is worth collecting the first year students' data because they are the main users to use our e-learning system in coming few years.

A questionnaire was developed and distributed to students during the fall semester. Participation in the survey was on voluntary basis and all responses were anonymous. The survey comprised of a combination of Likert scaled, and ranking scaled questions. Students' e-learning experience and social networking usage data were collected. Then, the later analysis would be based on descriptive statistics, frequency distribution and correlation.

5 Preliminary Findings

70 of the students who had enrolled in the post-secondary programme took part in this survey held in the fall semester. The survey included five broad types of measures: demographic information, daily Internet usage, daily activities on social networking, students' attitudes towards on social networking, and students' perception towards on using social networking for learning. The survey data were analyzed by the "SPSS" software. In our sample, 33% and 67% of the students were male and female respectively. All respondents were below 25 years old, about 83% of them were 18-20 and 17% of them were 21-25.

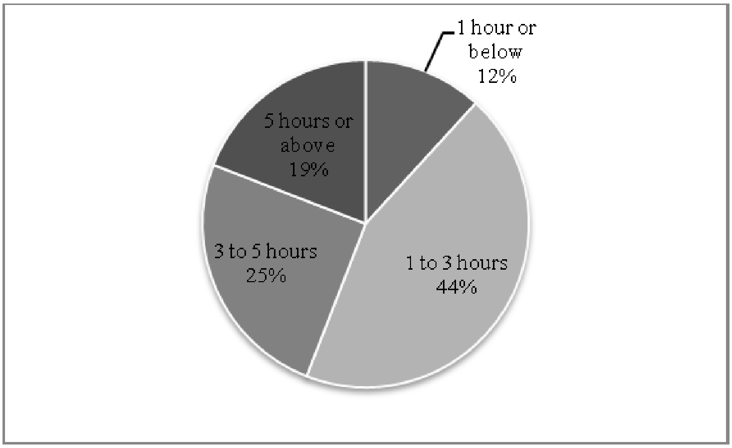

Fig. 1. Number of hours spent daily on Internet

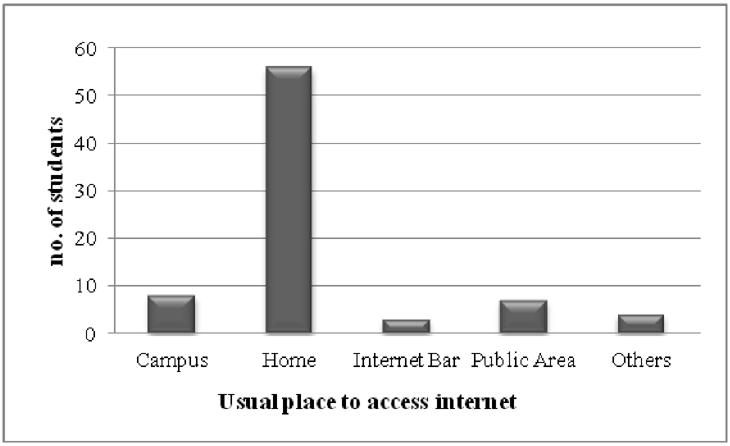

Fig. 2. The usual place to get Internet access

From the survey, 83% of the students had used Internet more than six years. In the Internet usage intensity measure, there were 44%, 25% and 19% of the students spending 1 to 3 hours, 3 to 5 hours and 5 hours or above daily on the Internet respectively. There were only 12% of the students spending one hour or less daily on the Internet, as shown in Figure 1. In the usual place to get Internet access measure, students could select more than one option at this item. From the result, the most popular place to access Internet was at home and 56 students selected this item, as shown in Figure 2. On the other hand, other options are not significant.

In the daily e-learning activities spending measure, there were 26%, 65% and 7% most of the students spending 1 hour or below, 1 hour to 3 hours and 3 to 5 hours daily on e-learning activities respectively. There were only 2% of the students spending more than 5 hours per day on e-learning activities, as shown in Figure 3.

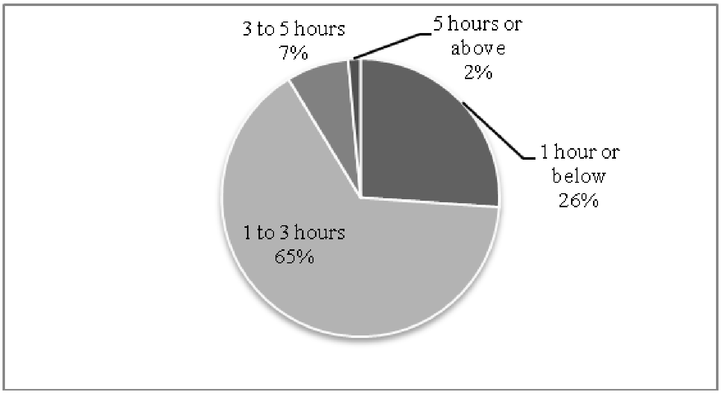

Fig. 3. Number of hours spent daily on conducting e-learning or related activities

Over 97% of the students have at least one social network accounts. The daily social networking activities measures were shown in Figure 4. 40% of the students used social networking for seeking new friends. 29% and 19% of the students used social networking for information exchange and discussion of homework respectively.

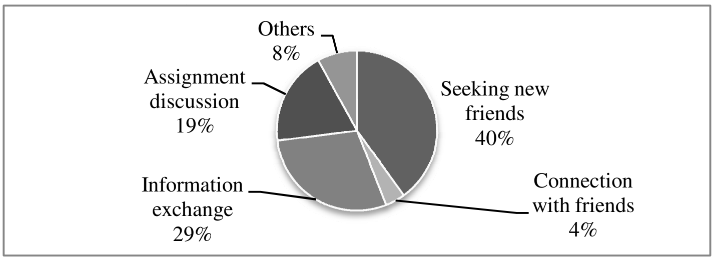

Fig. 4. The distribution of social networking activities

In the measures of students' attitudes towards social networking, three items had been developed. These items were:

- "Attribute – activity usage" –
  Students thought accessing to social networking site had become a daily activity for them.
- "Attribute – membership" –
  Students thought they considered themselves as a member of the community in social networking sites.
- "Attribute – lagged behind" –
  Students thought they would feel lagged behind if they stop accessing social networking sites.

68% of the students agreed or strongly agreed that accessing to social networking site had become a daily activity for them, as shown in Figure 5. Over 62% of the students agreed or strongly agreed that they considered themselves as a member of the community in social networking sites. However, about 38% of the students agreed or strongly agreed that they would feel lagged behind if they stop accessing social networking sites. These three items reflected students' attitude on using social networking and they were highly correlated, as shown in Table 1.

Table 1. The correlation among the three items related to students' attitudes towards social networking

Correlations

		Attribute – activity usage	Attribute – lag behind	Attribute – membership
Attribute – activity usage	Pearson Correlation	1	.257*	.512**
	Sig. (2-tailed)		.034	.000
	Sum of Squares and Cross-products	77.691	18.206	31.373
	Covariance	1.160	.272	.475
	N	68	68	67
Attribute - membership	Pearson Correlation	.512**	.509**	1
	Sig. (2-tailed)	.000	.000	
	Sum of Squares and Cross-products	31.373	28.896	50.448
	Covariance	.475	.438	.764
	N	67	67	67
Attribute – lagged behind	Pearson Correlation	.257*	1	.509**
	Sig. (2-tailed)	.034		.000
	Sum of Squares and Cross-products	18.206	64.529	28.896
	Covariance	.272	.963	.438
	N	68	68	67

*. Correlation is significant at the 0.05 level (2-tailed).

*. Correlation is significant at the 0.01 level (2-tailed).

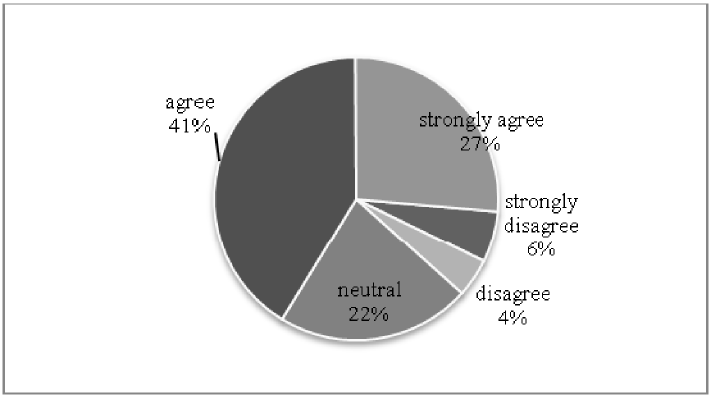

Fig. 5. The distribution of the students' attitudes on accessing to social networking site had become a daily activity

Furthermore, we found that three items related to "students' attitudes towards social networking" could be combined into one factor. This factor was named "SN_loyalty_attitude" was formed. The Cronbach's alpha of these three items was 0.688, as shown in Table 2. The Cronbach's alpha is a coefficient of consistency or reliability of the data, which shows how closely a set of items are related. In general, a reliability coefficient Alpha of 0.70 or higher is considered acceptable in most Social Science research situations [14]. Although the value of Cronbach's alpha was 0.688, it was just slightly below 0.70. The value was still considered as marginally acceptable.

Table 2. Cronbach's alpha of the three items related to students' attitudes towards social networking

Reliability Statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	Number of items
.688	.699	3

Item-Total Statistics

	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted
Attribute – activity usage	6.70	2.607	.452	.263	.672
Attribute - membership	6.94	2.693	.636	.405	.444
Attribute – lagged behind	7.37	2.844	.445	.260	.669

On the other hand, in order to investigate whether students' learning would be motivated more by using social networking technology and whether social networking was a potential e-learning platform, two items reflecting students' perception on using social networking for learning were developed.

These items were:

- "Like SN more than LMS" –
  In comparison to other learning management systems, students would prefer using social networking sites to discuss students' assignments.
- "SN can help learning" –
  Students thought that learning would become more effective when they formed study groups on social networking sites.

This results obtained on the survey were analyzed by SPSS. These two items showed positive significant correlation with each other. The Cronbach's alpha was 0.731 as shown in Table 3. The presented data showed that these items were of high internal consistency or reliability, and hence could be combined into one factor. Thus, two items related to "students' perception towards social networking for learning" were combined into one factor named "SN_learning_perception".

Table 3. The Cronbach's alpha of the three items related to students' perception towards social networking for learning

Reliability Statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	Number of items
.731	.736	2

Item-Total Statistics

	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted
Like SN more than LMS	3.53	.636	.583	.340	.
SN can help learning	3.26	.862	.583	.340	.

Then, this factor "SN_learning_perception" together with the previous factor "SN_loyalty_attitude" are further analyzed by SPSS using regression analysis. The results indicate that that they are positively significantly related and can form a regression line. The linear regression analysis between two factors is shown in the Table 4.

Table 4. The linear regression analysis between two factors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.948	.507		3.841	.000
	SN_loyalty_attitude	.409	.140	.415	2.920	.006

a. Dependent Variable: SN_learning_perception

However, in the measure of frequent use of social networking sites for learning, only half of the students regularly used social networking sites or e-learning platforms to assist learning. Figure 6 indicates that half of the first year students still need to develop their e-learning strategies.

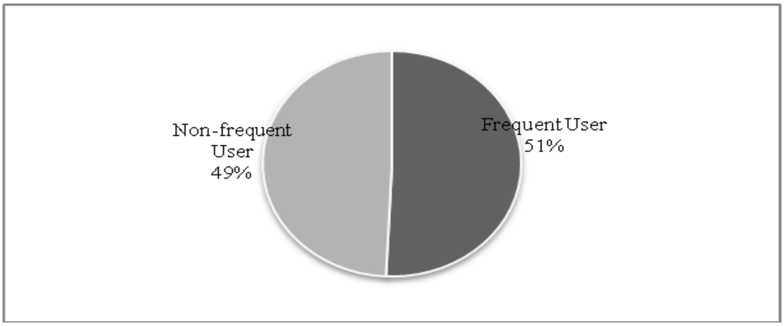

Fig. 6. The distribution of students in frequent usage on social networking or learning management systems to assist learning

6 Discussion

The results indicated that most students preferred using social networking to share information and communicate with their friends. Although the Institute's learning management system provides similar features for discussion and forming groups, students seem to have no interest in using it. The reasons why students like to use social networking technology or other tools may be simply their habits or daily usual rituals. We may conclude that students have already built an online community in social networking sites and they are willing to spend more time in there.

Another finding indicates that there is a significant positive correlation between students' attitudes towards social networking and their perception towards social networking for learning. Thus, we may assume that if students like social networking sites, they have positive perception on using social networking sites to conduct learning activities. If teachers can design some learning activities conducting on social networking sites, this may enhance the collaborative learning among students.

On the other hand, there is no evidence that students are committed to e-learning. The quantitative data indicated that only half of the students used learning management system or social networking regularly to assist their learning. Although they knew how to use those technology-based tools, they had no intention of using them to maximize their learning. On the contrary, half of the students resisted the use of technology in their learning. Some students showed no interest in engaging in e-learning, and they may habitually use the traditional learning strategies. Some were very conservative and hesitant to develop an e-learning strategy in this new learning environment. On the other hand, half of them liked to use social networking sites to discuss assignments or to conduct learning activities. They agreed that forming discussion groups on social networks may help learning. Finally, the results indicated that the more experience the students had with social networking, the more positive they appeared to be towards the use of technology for learning.

One of the limitations to this research is that the sample size is only 70 students and is not big enough for comprehensive data analysis. The students participating in this research can only reflect the characteristics in first year students. Therefore, the research findings are not completely representative and cannot be generalized. However, these limitations can be improved by increasing the simple size, scope and depth of the research area.

7 Conclusion

Since social networking can provide a virtual interactive environment for students' participation, it seems to be an ideal platform to build learning community and enhance collaborative learning. Indeed, educators are exploring the use social networking to promote peer interaction and collaborative learning. The goals of this research are to explore the first year students' experiences on social networking usage and their perception to use it for e-learning. The quantitative data were collected by surveys on the students' experience and perception on using social networking as a communication and collaboration tool.

According to the preliminary findings, the research team believes that students will be more inclined to utilize social networking for performing their learning tasks. Social networking can be used to effectively promote online community and enhance collaborative learning amongst students. It appears that social networking can motivate students' participation in communication and discussion of assignments, it may reinforce students to engage more in e-learning. Furthermore, students' perception on using social networking sites in e-learning is positive and useful, especially in a user friendly environment. If teachers can design some learning activities conducting on social networking and cooperate with learning management system, it may effectively promote online community and enhance collaborative learning amongst students. However, the preliminary findings showed that only half of our students preferred using social networking or e-learning platform to assist their learning. It is a challenging task for our instructors to motivate the other half of the students to engage in using e-learning platform. It may be a wise idea to try to integrate learning management system with popular social networking sites such as Facebook. Although, the sample size is relatively small, the findings are very useful for preparing a larger scale research.

Acknowledgement. This project *Social Communication Networking and Multimedia Lab for Excellence in Teaching and Learning Enhancement* is funded by the Education Bureau (EDB) of the Government of the Hong Kong Special Administrative Region of the People's Republic of China under the Quality Enhancement Grant Scheme (QEGS).

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Designing an Intelligent Interactive Tool for Scaffolding Concept Map Construction*

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Abstract. Nowadays concept maps (CMs) are widely used in many fields and there are many tools assisting users in constructing a CM. Nevertheless, some users may also have difficulties in extracting a CM from a text. To cope with this problem, an intelligent interactive tool for scaffolding concept map construction is proposed to assist users in CM construction. A preliminary experiment has been conducted to evaluate the efficiency of this tool. The experimental results show that the proposed tool has some beneficial effects on helping users construct a CM.

Keywords: concept map, concept map mining, concept map tool.

1 Introduction

Since Novak brought forward CMs, they have been widely used in many fields. As Holsapple pointed out that CMs can help users in understanding knowledge and in using knowledge effectively [1], CMs are getting increasing attention from both educators and researchers. Tools for scaffolding CM construction are springing up one after another, like CmapTools [2], which is a software environment that empowers users, individually or collaboratively, to represent their knowledge using CMs, to share them with peers and colleagues, and to publish them. Although with so many tools in hand, some users may also have difficulties in extracting a CM from a text.

Chang et al. developed a computer-based concept mapping system to assist students in CM construction, with a predefined expert CM [3]. However, getting expert CMs for users is difficult in the era of information explosion and manually constructing a CM is a time-consuming and hard task. Concept map mining (CMM) is a process of extracting information from one or more documents for automatic creation of a CM [4].

In this study, we designed an intelligent interactive tool featured in automatic recommendation of concepts and their relations, to help users better construct a CM. And the recommendation is based on a CM generated with a statistical CMM method.

* This research work is supported by National Natural Science Foundation of China (NSFC: 61075048).

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S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 280–289, 2013.

2 Related Work

There are a number of studies focused on CMM in various fields. Classified by the methods applied, these studies can be divided into two groups: the ones based on statistical methods and the ones based on natural language processing techniques.

Statistical Methods. The rationale for these methods is analysis of the frequency of terms and their co-occurrence in a document.

Chen et al. extracted e-Learning domain CMs from academic articles [5]. They adopted some relevant journal articles and conference papers in e-Learning domain as data sources, and applied text-mining techniques to automatically construct CMs. And then, they used the "keywords" listed in journal articles as the "nodes" to represent concepts and treated the "relation strengths" between any two keywords appearing in the articles as the "links" to represent concept relationships. The "relation strength" between two keywords was measured by the distance of the two keywords appeared in the articles. The constructed CMs were used for providing a reference for researchers, who are new to the e-Learning field, to study related issues, for teachers to design adaptive learning materials, and for learners to understand the whole picture of e-Learning domain knowledge.

Tseng et al. mined a CM from two years of Chinese news articles for measuring Taiwanese civic scientific literacy in media [6]. From the Chinese news stories, key terms were first extracted by a simple, yet effective, rule-based algorithm. They were subject to an association analysis based on their co-occurrence in sentences to reveal their term-to-term relationship. Then, the key terms were matched against the textbook terms and examined together with their related terms by two experts. After excluding non-scientific terms, some key terms were selected. Together with their related terms, a set of terms results from this selection process. As the terms were identified from occurrence in media, the test items were developed with the intention of provide context and daily-life-related questions, thus probing whether the reader could understand the meaning and use of a term in a daily-life context.

Lee et al. automatically built a domain knowledge map for e-Learning by using text mining techniques [7]. From a set of documents about a specific topic, keywords were extracted using the TF/IDF algorithm. A domain knowledge map was based on ranking pairs of keywords according to the number of appearances in a sentence and the number of words in a sentence. Sentences in the documents were organized according to keywords. Users could learn the context of these sentences from the keywords and relations. Then, they could read the sentences related to the keywords or relations. The experiments showed the knowledge map tool could recall and identify most important sentences in the texts. Furthermore, according to the experiments, knowledge map provided a mechanism with which to distinguish the more important sentences.

Natural Language Processing Techniques. The basic approaches for these techniques are parsing the text and identifying the part of speech (POS) of terms.

Oliveira et al. presented a TextStorm system that could extract as many concept interrelations as possible from texts [8]. This system used parsing of sentences to build binary predicates that represent domain knowledge from the texts in hand. Binary predicates were composed employing parsing with an augmented grammar. The parameters of this grammar were the key factors in a sentence that represent relations: verbs and adjectives. The first one implied the correlation existing between two concepts; and the second one meant the notion of property.

Valerio et al. presented an ongoing research on bootstrapping the CM generation process, by generating preliminary CMs based on documents [9]. They had implemented an initial algorithm for this process, and had evaluated one central component, a domain-independent algorithm to extract a list of concepts from a document, ranked by their relevance to the source document. The algorithm used a deep syntactic parse to select noun phrases with different levels of granularity when desired.

Valerio et al. presented a top-down/bottom-up algorithm to extract information from documents to construct CM indices automatically, using target CMs as context to refine the assignment of concept labels [10]. The algorithm took advantage of existing natural language processing techniques to extract information efficiently from documents. Meanwhile, it used existing concept map knowledge models to guide the construction process as a higher-level semantic information source.

3 Tool Design and Methodology

As mentioned in the previous review, CMM from texts can adopt either statistical methods or those based on natural language processing techniques. The latter may lead to less ambiguous relations; however it is more language-dependent and requires more manually maintained resources [6]. Moreover, there are some technical bottlenecks in context semantic comprehension which we cannot deal with properly. Therefore, we choose a statistic approach as our basic method to mine CMs from texts.

Since we use the statistical approach, the collection of text documents from which we mined CMs should be better to have the same topic or a similar topic. Because we deem that more similar the topic articles have, more frequently the key terms appear in different articles, and then the result of concept mining would be better.

There are three main steps in the procedure: key term extraction, term association analysis and automatic recommendation. The technical details are explained in the following sections.

3.1 Key Term Extraction

Before extracted from texts, the key terms should be identified first. Identification differs in various languages. In Chinese, words may range in length from a single character to nine or even more characters. In many cases, a Chinese word and its component characters have their own meanings. So it makes it very difficult to know whether a Chinese term is a single-character word or multi-character word. Moreover, there are no lexical boundaries between words in Chinese texts. It makes key terms a challenge to identify.

Tseng et al. proposed an algorithm to extract key terms from the text automatically [6]. Their algorithm worked with the help of a stop word list alone, without other sources, like corpora, lexicons, or dictionaries. They assumed that a collection of texts concentrating on a topic was likely to mention a set of strings many times. And a long repeated string was always a right key term. The purpose of their algorithm is to attempt to find the repeated strings which are as long as possible.

Our method is derived from theirs. In addition, we use a part of speech (POS) tool, a synonym list and an acronym mapping table to improve the performance of the algorithm.

POS Tool. We use Chinese text POS tool ICTCLAS [11] to parse and tag the collection of Chinese texts. Then we input the result of word segmentation into an ordered list. At the same time, according to the semantic annotation of each word, we pick out some words which are unlikely to be treated as key terms, such as pronoun, conjunction, auxiliary word, preposition, quantifier, etc., and enter them into the stop word list.

After the texts processing, the algorithm proposed by Tseng et al. is adopted to extract key terms from texts. The details of algorithm are described in [6]. What's more, we make a change to it. Since our purpose is to extract the repeated strings as long as possible, the threshold of extracted key terms is reduced as the iterative merging process ran. Then we can get a key term list with word frequency.

Synonym List. Although all the texts are about the same topic, the term chosen by different authors are not always consistent. On various occasions, authors may describe the same concepts with similar but not exactly the same terms. Therefore, we establish a synonym list to map the similar terms and remove them from the key term list except the term with the highest frequency. Then its word frequency is updated with the sum of all the similar terms' frequencies.

Acronym Mapping Table. An acronym is a specific form of an abbreviation created from the capitalized initial letters or parts of a series of words [12]. Acronyms are frequently used in articles. So we establish an acronym mapping table to store these acronym mapping terms for documents. And then, we delete the acronyms from the key term list and add their word frequencies to their respective terms'.

3.2 Term Association Analysis

Various indices or coefficients have been proposed to calculate association between two terms, as shown in fig. 1, where $n_{j,k}$ denotes the number of documents in which both terms T_j and T_k occur, and n_j (n_k) denotes the number of documents in which T_j (T_k) occurs regardless of T_k (T_j) [13][14]. However, these methods for term association analysis are based on the number of times two terms co-occur in the same documents.

$I(T_j, T_k) = n_{j,k}/\min(n_j, n_k)$ Inclusion Index	$P(T_j, T_k) = (n_{j,k}/ n_j*n_k)*n$ Proximity Index	$E(T_j, T_k) = n_{j,k}/n_j*n_{j,k}/n_k$ Equivalence Index
$Dice(T_j, T_k) = 2*n_{j,k}/(n_j+n_k)$ Dice Coefficient	$Jaccard(T_j, T_k) = n_{j,k}/(n_j+n_k-n_{j,k})$ Jaccard Coefficient	$Cos(T_j, T_k) = n_{j,k}/\sqrt{(n_j*n_k)}$ Cosine Similarity

Fig. 1. Various association measures for two terms

Chen et al. proposed three assumptions to define relations among keywords [5]: 1) If two keywords appear in one research article, it implies that a certain relation exists between these two keywords; 2) The higher the frequency of occurrences of two keywords appearing in one sentence, the higher the relation is between them; 3) The shorter the “distance” between two keywords in one sentence, the higher the relation is between them. Besides, Lee et al. deemed that as the number of words in a sentence increase, the relation between two keywords decrease [7]. In other words, the score of a relation in a shorter sentence is higher than the score of a relation in longer sentences.

Based on the assumptions and opinions mentioned above, a modified Cosine Similarity is chosen to measure the association weights as:

$$\mathrm{wgt}(T_i, T_j) = \frac{s_{ij}}{\sqrt{s_i \cdot s_j}} \cdot \left(\log \frac{\max(avg_{num_{ij}})}{avg_{num_{ij}}}\right)^{\alpha} \cdot \left(\log \frac{\max(avg_{d_{ij}})}{avg_{d_{ij}}}\right)^{\beta}, i \neq j. \tag{1}$$

where $wgt(T_i, T_j)$ is the degree of correlation between the term i and j. The variable s_{ij} is the number of sentences in which term i and j co-occur. And s_i (s_j) denotes the number of sentences in which T_i (T_j) occurs regardless of T_j (T_i). α and β are regularization parameters.

$$avg_{d_{ij}} = \frac{\sum_{m=1}^{s_{ij}} d_m}{s_{ij}}, i \neq j. \tag{2}$$

where d_m denotes the number of characters between the term i and j in the sentence in which both terms occur.

$$avg_{num_{ij}} = \frac{\sum_{m=1}^{s_{ij}} num_m}{s_{ij}}, i \neq j. \tag{3}$$

where num_m denotes the number of characters in the sentence where term i and j co-occur.

3.3 Automatic Recommendation

After key term extraction and term association analysis, we can obtain a global CM on a specific topic. For a given article, the process of constructing the local CM comprises the steps as following:

Traverse the Synonym List and Acronym Mapping Table. Since there may be synonyms or acronyms, the program would traverse the synonym list and acronym mapping table. If there is any term appearing in the list or table while not in the global CM, it is added to the duplicate of the global concept map as a new node. Moreover, relations of the term corresponding to the new node in the list or table and existing in the concept map are copied to the new one as its own relations.

Update Nodes and Links. The program traverses the revised duplicate and deletes the nodes never appearing in the given article. Besides, the links associated with the deleted nodes are removed as well. Then the links are verified in the duplicate. If two connected nodes never co-occur in any sentence in the given article, we deem that there is not a certain relation between the two nodes in this article and the link between them is removed.

After completing all these steps, we treat the final revised duplicate as the local CM of the given article.

The kernel of this tool is automatic recommendation based on the local concept map, including node recommendation and link recommendation.

Node Recommendation. For a specific node, the tool will recommend all the nodes associated with it in the local concept map. What's more, the recommended nodes are sorted by the degree of correlation between each recommended node and the given one. For two or more nodes, nodes associated with all the given nodes will be recommended based on the local CM. And the recommended results are sorted by the average degree of correlation between every recommended node and the given ones.

Link Recommendation. The tool will recommend all links associated the given node with the other nodes in the drawing area. Besides, all the recommended links are sorted by the degree of correlation.

4 Implementation and Evaluation of Tool

4.1 Implementation

We have implemented the tool based on the design and methodology mentioned in section 3. Based on the global CM, the tool would automatically recommend nodes or links when users are drawing a CM. The UI of this tool is illustrated in fig. 2.

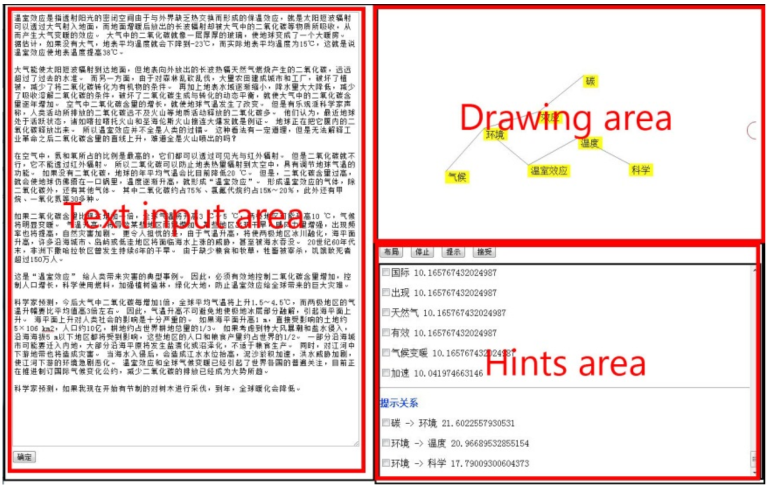

Fig. 2. UI of the interactive tool

As shown in the figure above, UI of this tool can be divided into three areas: text input area, drawing area and hints area.

Text Input Area. The article entered into this area would better have the same topic with the global CM. According to the methods described in section 3.3, the tool could obtain a local CM corresponding to the entered article.

Drawing Area. Users can construct a CM in this area. It provides basic functions of CM construction, including creation, deletion and modification. If the user chooses one or more nodes and clicks the hint button, according to the node recommendation method described in section 3.3, corresponding recommended nodes will be displayed in the hints area. Meanwhile, based on the link recommendation method, all the possible links associated the chosen node with the other nodes in drawing area will be displayed in hints area as well.

Hints Area. All the recommended results are displayed in this area. Every hint node or link has a check box before it. Users can select those they think right and click the accept button. Then the selected nodes or links will be added to the CM in drawing area.

Of course, if users think the hints are not suitable, they can ignore them and construct the CM by themselves.

4.2 Evaluation

A preliminary experiment was conducted to evaluate the efficiency of this tool.

Data Set. Since we adopted a statistical approach as our basic method to mine CMs, the texts where CMs are extracted should be better on a specific topic. Finally, we chose "greenhouse effect" as the experimental topic. We obtained 49 articles retrieved from Baidu, a Chinese search engine. After parsing by ICTCLAS, 62931 words were remained.

Participants. Eight participants were invited to construct CMs based on two articles about greenhouse effect respectively, a short one (448 Chinese characters) and a long one (759 Chinese characters). To decrease misunderstandings, they were given enough time to read the articles thoroughly.

Procedure. An article was entered into the text area and a corresponding local CM was produced. Basing on the local CM, the tool would show some tips in the hints area. According to the entered article, participants respectively constructed a corresponding CM in the drawing area. If they thought the tips were inappropriate, they could completely neglect them. The only requirement was that they should construct the CM as correctly as they could. When the participants were constructing the CM, software for screen recording was used for logging the entire process.

Experimental Results. According to these video records, we performed statistical analyses of acceptance rates (AR) of nodes and links in the process of CM construction with the help of this tool. AR of nodes (links) represents the proportion of the number of nodes (links) picked up from the hints area to the total number of nodes (links) in the final CM. The descriptive statistics were shown in table 1. AR of nodes is around 0.5, while AR of links is around 0.4. Moreover, the standard deviation of each group is a little high. Although the acceptance rates shown in table 1 are not very high, they also indicate that this tool has some beneficial effects on helping users construct a CM, even if not all the hints are useful to them.

Table 1. Descriptive statistics of the AR of nodes and links of each article

Article	AR	N	Mean	SD
The short one	AR of nodes	8	0.59	0.27
	AR of links	8	0.41	0.31
The long one	AR of nodes	8	0.47	0.31
	AR of links	8	0.35	0.32

Table 2. MANOVA result of AR

	F	Sig.
Article	5.20	.03
Node or Link	13.59	.00
Participant	25.76	.00

Table 2 shows the Multivariate Analysis of Variance (MANOVA) result of AR on different articles, different types of prompts and different participants. It is found that articles, types of prompts and participants have significant influence on AR.

5 Discussion

In this study, a preliminary experiment was conducted by inviting eight participants to construct CMs with the help of our tool. The experimental results are shown in table 1 and table 2 and they are not as good as we expected. There are many factors influencing the result of AR, such as articles, types of prompts and participants, etc.

Different types of prompts have different AR. It is likely that prompts of nodes are more accurate than links'. It also can be seen from the video records that after adding some nodes in the CM, users may link the nodes manually and forget to search the suggestive links in hints area. Since the function of automatic recommendation is new to them, users may not be used to checking the prompts.

What's more, from the video records, it can be seen that even based on the same article, the CMs users constructed may be much different from others'. It agrees with the fact that CM represents the constructor's comprehension of an organization of content [15] and the result that participants have significant influence on AR. It may be an important factor influencing the accuracy of hints and it is the difficult part of automatic recommendation.

As shown in table 2, different articles have different AR. The short one has a higher AR than the long one does. It may be because that key information is more concentrated in the short one. On the contrary, there is more interferential information in the long article. Furthermore, there is an interesting finding that ARs of several nodes and links are particularly high. It may be due to the method mining CMs and the requirement that the article entered into the text area should have the same topic with the global CM. Thus, some important words or phrases frequently appear in articles on this topic. On the other hand, we may miss some valuable information if the words or phrases don't always exist in the articles on this topic. It would require the natural language processing techniques to deal with this problem.

6 Conclusion

In this paper, an intelligent interactive tool for scaffolding concept map construction is proposed to assist users in constructing a CM based on an article on a specific topic. The function of automatic recommendation is based on the global CM, which is mined based on the statistical methods. A preliminary experiment has been performed to evaluate the efficiency of this tool. The experimental results showed that this tool has some beneficial effects on helping users construct a CM, even if not all the hints are useful to them.

In addition, it can be seen from the experimental statistics that there are many factors influencing the result of acceptance rates, such as articles, types of prompts and participants, etc. All these make it difficult to give personalized recommendation.

Furthermore, this tool can be used in many scenarios, like diagnosing errors of CMs, personalized teaching and collaborative learning, etc. To be widely accepted, it needs to be improved to adapt to these scenarios.

In the near future, we will try to combine the natural language processing techniques with the statistical method to improve the performance of this tool. Moreover, we will attempt to apply it to learning applications and conduct a full experiment to assess the efficiency of it.

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Requirements Framework for Personalized Real-Time Feedback in Interactive Agent-Based E-Learning Systems

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Abstract. E-learning systems at the market do not adequately support learning in a constructivist way because they do not adapt to the special needs and personal attributes of individual learners. Eliciting complete and correct requirements is a major challenge in personalized learning. Literature review and Interviews conducted with twenty lecturers helped in the design of questionnaires administered to three hundred second and third year students of Bachelor of Science Education and IT related courses from two universities in Uganda. Respondents were allowed to interact with two types of systems A that gave feedback at the end of each task and B at every stage during a learning process. The nine attributes used in the design of the questionnaire got the lowest response being 55.8% (feedback) and the highest 74.2% (Personalizing learning). These were used to design the basic requirements framework needed for personalized learning with real-time feedback in e-learning system.

Keywords: Agent-Based Approach, E-Learning Systems, Framework, Interactive and Real-Time Feedback.

1 Introduction

In order to align with the rapid change of the new knowledge intensive era, a new vision for learning is required [1]. There is need to broaden what students learn, when they learn, where they learn, how they learn, and the rate at which they progress in achieving learning outcomes [2]. Thus a fundamental shift is needed towards a more personalized, social, open, dynamic, emergent and knowledge–pull model for learning as opposed to the one-size-fits-all, centralized, static, top-down, and knowledge–push models of traditional learning solution [3]. The need has arisen for the consideration of individual differences, to include their learning styles, learning orientations, preferences and needs in learning to allow learners engage and be responsible for their own learning, retain information longer, apply the knowledge more effectively, have positive attitudes towards the subject, have more interest in learning materials, have higher scores and high intrinsic motivation level [4]. E-learning systems currently at

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 290–300, 2013.

the market do not adequately support the learning in a constructivist way because they do not adapt to the special needs and personal attributes of individual learners [5]. Based on the review of previous research, online personalized learning environment is the best learning medium for individual difference approach, in that it has impact on students' achievements and satisfaction in learning [4].

Several interactive platforms have been proposed for sharing learners' ideas, integrating mutual knowledge or providing feedback. These approaches still lack the consideration of cognitive differences among the learners resulting in very limited success [6]. Other researchers also point out that, although design education is already taking full advantage of the just in time and economy of online information, the online teaching materials suffer from scanty content, poor interactivity, and sense of insufficient participation [7]. Due to poor interactivity and sense of insufficient participation, learners can easily loose track and motivation during learning in an e-learning environment hence drop out. A major challenge facing providers of e-learning is provision of meaningful interactive courseware that is responsive to learners, allowing them to actively participate in the learning process [8]. Considering the popularity of the Internet, an automatic interactive feedback system for e-learning websites is becoming increasingly desirable [9]. More work needs to be done on the introduction of e-learning technology in a Ugandan education system especially in the use of agent technology for personalized real-time feedback generation to address the cultural diversity of the learners and their varying learner needs [10].

In an online learning environment, there is need to create a more effective interaction between the e-learning content and the learners [11]. New kinds of support systems are needed for effective interaction and to provide RF during learning process in e-learning. Agent systems can provide better support here as they can provide greater flexibility in the way learners utilize services provided by learning management systems (LMS) [12]. In this LMS, the feedback is generated by consolidating the predefined information after the learner has been assessed [13]. However, there is no mechanism in place for the feedback to reflect the learning objectives set for the overall learning content and achievements at different learning stages [14]. Furthermore, the feedback mechanisms that are used by the learners have changed with advances and growth of web-based learning systems [13]. To match with the changing learner needs, feedback mechanisms and the growth of web-based learning systems, there is need for an interactive agent –based approach to real-time feedback (IAARF) mechanism that will help the learners in their learning path [15]. To provide this kind of feedback would satisfy a degree of success for individual questions, but it is difficult to customize feedback according to individual learner performance and to support continuous improvements during the learning process [14]. However, eliciting complete and correct requirements is a major challenge in personalized learning and incorrect requirements are a constant source of defects. The purpose of this study focuses on the requirements framework for personalized real-time feedback in e-learning systems during a learning process. It also examines the link between feedbacks, and learning process, discusses in details the various factors necessary for real-time feedback generation in e-learning.

2 Related Works

As the learning paradigm shifts to a more personalized learning process, users (learners, tutors, and instructional designers) need a dynamic feedback from their knowledge path [14]. A dynamic feedback addresses the changing needs of the learner because it is generated after monitoring what the learner wants at that time. The more immediate the feedback the better, because each step of learning builds upon the previous one. If no feedback is given, then the next step may be built upon an incorrect interpretation. Learners appreciate real-time feedback that helps them to improve [16]. The feedback given to the learner should be carefully phrased and timely provided in order to optimize its impact upon learning not demoralize the learner. It helps learners to maximize their potential at different stages of learning, training, raise their awareness of strengths and areas for improvement, and identify actions to be taken to improve on performance. Feedback is part of the overall dialogue or interaction between a teacher and the learner, not a one–way communication in the traditional classroom situation. Too often feedback in higher education comes after the course units are completed and too late to be of much use to learners. A new vision of learning requires a fundamental shift from current content-oriented e-learning solutions towards a more user-centered, interactive and collaborative model of learning [17].

2.1 Feedback in E-Learning

Feedback is information provided to compare the user's performance with that expected by the system [18]. In web-based learning, feedback presented by the computer is to replace that given to the learner by the teacher and to improve learner performance [2]. Hence the main role of feedback in web-based systems is to inform and motivate the user to increase his or her effort and attention [19]. The effectiveness of any system depends greatly on the feedback timing and style [20]. Feedback mechanisms that are used by learners have changed with the advances and growth of web-based learning systems [13]. The effective elements of online teaching include frequent and consistent online feedback, diplomatic online feedback and evaluative online feedback [18].

2.1.1 Classification of Feedback

Several types of feedback are discussed in the literature as shown in figure 1. One of the feedback classifications is that of negative and positive feedback. The feedback is said to be positive if the resulting action goes in the same direction as the condition that triggered it, hence tends to increase the output and speed up the process [18]. While negative feedback tends to oppose the condition that triggered it. Feedback can also be classified as immediate and delayed. Immediate feedback is given to the user directly after the answer to the task while delayed feedback is presented after a group of tasks [18]. Immediate feedback may also be looked at the level of learner

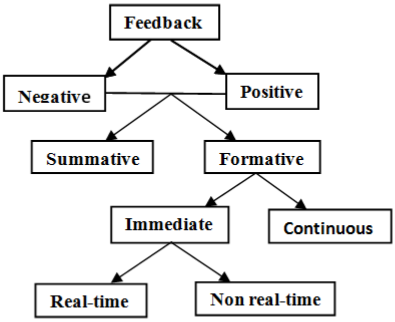

Fig. 1. Feedback Types

interaction with the system at every step in the task process. This is known as interactive real-time feedback. Lastly, feedback can also be classified by the user progress within the task into immediate, continuous (formative) and summative feedback [18]. Immediate feedback presents the results of one of the tasks; continuous provides information about the learner's progress within the course while summative feedback presents a summarized result of a number of user's actions.

3 Research Question, Aim and Objectives

The research question is: What are the requirements for personalized real-time feedback in e-learning during learning process? In order to answer this research question, the researcher came up with the following research aim: To propose a requirements identification framework for real-time feedback in e-learning system during a learning process. To address the research aim, it was necessary to come up with the following specific objectives: i) to test the students' preference on two types of systems during learning in order to identify the type of feedback the students like most. ii) to identify the requirements for feedback in e-learning, iii) to design a requirements identification framework for real-time feedback in e-learning system, iv) to validate the framework proposed.

4 Methodology

A survey was carried out by administering questionnaires to students of higher learning and interviews held with their lecturers. These students and lecturers were drawn from two Universities, one public Busitema University, faculty of Science and Education, department of computer studies and department of education. The other private one is Uganda Christian University, faculty of Science and Technology, department of Information Technology. In Uganda Christian university, due to the large numbers of students, two hundred second and third year students were randomly selected for interview about their opinion of the type of feedback they would prefer during learning process in e-learning system. All these two hundred students were from Information Technology (IT) background. While in Busitema University, due to the small numbers all the one hundred second and third year students doing computer studies as a course were interviewed. The students of Busitema University are teacher-trainees, while those from Uganda Christian University are purely IT trainees. Lecturers from the corresponding courses were randomly selected and interviewed.

During analysis of the results the following was done as a way of validating the results:

a) Students pursuing teacher education (100),
b) Students doing IT courses (200),
c) Lecturers of IT with education background (8),
d) Lecturers of IT with no education background (12).

The results from this survey together with the secondary data from literature review were used to arrive at the proposed requirements framework for personalized real-time feedback in e-learning during learning process.

4.1 Participants

A total of three hundred (300) second and third year students of Bachelor of Science Education and other IT related degree courses and twenty (20) lecturers of the same programmes were randomly selected for the study from Busitema University and Uganda Christian University in Uganda. Second and third year students were used because they already have knowledge about e-learning systems, while IT lecturers were used because they have experience with the e-learning systems. These respondents were allowed to interact with two types of systems A and B. System A gives feedback at the end of the task while system B gives feedback at every stage during a learning process. The course unit used in the study was Computer Applications which is done by all the students in their first year semester one.

4.2 Data Collection

After interacting with the two systems A and B which takes about 30-40 Minutes, the respondents were provided with the questionnaire to complete on the kind of system preferred together with the requirements needed on that system. The interface was designed in PHP to provide a user friendly interface. PHP was preferred because it is open source software and it is platform independent.

4.3 Survey Instruments

Questionnaire, interview guide and critical literature review were used to collect both qualitative and quantitative data in this study. The two systems used had the following characteristics:

System A: This system allows the learners to go through all the ten questions up to the end, then on submitting a feedback is provided to the learner. This system provides delayed formative feedback (Non-real time feedback).
System B: This system allows the learners to attempt the question and a feedback is given without any delay. The learner is given two chances before moving onto the next task. This kind of feedback is provided within a short time hence real-time feedback.

5 Data Analysis

Table 1 shows the responses of the respondents towards the carefully chosen attributes and sub-attributes for personalized real-time feedback in e-learning system. Nine attributes were used and each was broken further into sub-attributes as shown in table 1.

i) **Personalized Learning** as an attribute was broken down into eight sub-attributes namely: personalizing learning, learner materials, learner pace, learner goals, learner location, what to learn, when to learn and how to learn. A majority of the respondents ranging from 66.7% to 85.0 % agreed with the statement that: these sub-attributes affect personalized learning; while a minority ranging from 11.7 % to 23.3 % disagreed.

ii) **Feedback** had six sub-attributes namely: summative, formative, on demand, real-time, quality feedback and engaging. A majority of the respondents ranging from 63.3% to 66.7 % agreed with the statement that: these sub-attributes affect personalized learning; while a minority ranging from 16.7 % to 33.3 % disagreed. However, a minority of the respondents below 50% agreed that summation and on demand feedback affects personalized learning while a majority above 50% disagreed.

iii) **Motivation** had three sub-attributes namely: intrinsic, extrinsic and feedback motivation. A majority of the respondents ranging from 66.7% to 85.0 % agreed with the statement that: these sub-attributes affect personalized learning while a minority ranging from 21.7% to 28.3% disagreed.

iv) **Learner Needs** had three sub-attributes namely: Learner style, learner goals, learner preference. A majority of the respondents ranging from 63.3% to 83.3 % agreed with the statement that: these sub-attributes affect learning; while a minority ranging from 15.0 % to 30.0 % disagreed.

v) **Interactive** had one sub-attribute namely interactive. A majority of the respondent 63.3 % agreed with the statement that: Interactivity of the LMSs enhances learning; while a minority of 36.7 % disagreed.

vi) **Learner Background** had three sub-attributes namely: ICT skills, interest and learner readiness. A majority of the respondents ranging from 66.7.0 % to 73.3 % agreed with the statement that: these sub-attributes affect learning; while a minority from 20.0% to 30.0 % disagreed.

vii) **Learner Culture** had four sub-attributes namely: cultural background, values, attitudes and interest. A majority of the respondents ranging from 55.0% to 70.0

% agreed with the statement that: these sub-attributes affect learning; while a minority ranging from 25.0 % to 28.3 % disagreed.

viii) **Gender** had two attributes male and female but it was combined together. A majority of the respondents 66.7% agreed that gender has an effect in personalized learning; while a minority of 23.3% disagreed.

ix) **Learning Theory** had four sub-attributes namely: learning theory, Behaviorist, Cognitivists and Constructivists. A majority of the respondents ranging from 66.7% to 76.7 % agreed with the statement that: these sub-attributes affect personalized learning; while a minority ranging from 13.3 % to 30.0 % disagreed.

Table 1. Number of Respondents together with their Percentages

NO.	Attributes	Sub-Attributes	Responses (300 Respondents)					
			Agree (Agree and Strongly Agree)		**Neutral** (Neutral)		**Disagree** (Disagree and Strongly disagree)	
			Respondents	%	**Respondents**	%	**Respondents**	%
1	**Personalized Learning** -The following sub-attributes affect personalized learning.	Personalizing Learning	210	70.0	20	6.7	70	23.3
		Learner materials	250	83.3	0	0.0	50	16.7
		Learner goals	200	66.7	30	10.0	70	23.3
		Learner pace	225	75.0	15	2.0	60	20.0
		Learner location	200	66.7	0	0.0	100	33.3
		What to learn	225	75.0	20	6.7	55	18.3
		When to learn	215	71.7	15	5.0	70	23.3
		How to learn	255	85.0	10	3.3	35	11.7
2	**Feedback** -The following attributes affect personalized learning.	Summative	110	36.7	0	0.0	190	63.3
		Formative	190	63.3	20	6.7	90	30.0
		On demand	120	40.0	80	26.7	100	33.3
		Real-time	195	65.0	55	18.3	50	16.7
		Quality Feedback	200	66.7	30	10.0	70	23.3
		Engages	190	63.3	30	10.0	80	26.7
3	**Motivation** -The following sub-attributes are necessary in learning process.	Intrinsic	155	51.7	60	20.0	85	28.3
		Extrinsic	160	53.3	70	23.3	70	23.3
		Feedback motivates	215	71.5	20	6.7	65	21.7
4	**Learner needs** -The following affect learning.	Learner style	190	63.3	20	6.7	90	30.0
		Learner goals	230	76.7	20	6.7	50	16.7
		Learner preference	250	83.3	5	1.7	45	15.0
5	**Interactive** Interactivity of LMS enhances learning.	Interactive	190	63.3	0	0.0	110	36.7
6	**Learner Background** -The following affect learning.	ICT skills	210	70.0	0	0.0	90	30.0
		Interest	220	73.3	10	3.3	70	23.3
		Learner readiness	200	66.7	40	13.3	60	20.0

Table 1. *(Continued)*

7	**Learner Culture** -The following sub-attributes affect personalized learning.	Cultural background	165	55.0	60	20.0	75	25.0
		Values	180	60.0	45	15.0	75	25.0
		Attitudes	200	66.7	15	5.0	85	28.3
		Interest	210	70.0	10	3.3	80	26.7
8	**Gender** -Has an effect in learning.	Male and Female	200	66.7	30	10.0	70	23.3
9	**Learning Theory** -The following sub-attributes have effect in learning.	Learning Theory	230	76.7	30	10.0	40	13.3
		Behaviorists	170	56.7	50	16.7	80	26.7
		Cognitivists	150	50.0	60	20.0	90	30.0
		Constructivists	200	66.7	30	10.0	70	23.3

Table 2 shows the average responses of the respondents in carefully selected attributes. In this table nine attributes were considered for an e-learning system that will be able to provide a personalized real-time feedback during learning process.

Table 2. Average Percentage Responses on the Selected Attributes

NO	Attributes	Average Percentage Responses		
		Agree (Agree and Strongly Agree)	**Neutral** (Neutral)	**Disagree** (Disagree and Strongly disagree)
1	Personalized Learning	74.2	4.6	21.2
2	Feedback	55.8	12	32.2
3	Learner needs	58.8	16.7	24.4
4	Motivation	74.4	5.0	20.7
5	Learner Culture	63.3	0.0	36.7
6	Learner Background	70.0	5.5	24.4
7	Interactive	62.9	10.8	26.3
8	Gender	66.7	10.0	23.3
9	Learning Theory	62.5	14.2	23.3

The average responses were divided into three: agree, neutral and disagree. Agree and strongly agree were combined together to form agree, while disagree and strongly disagree were also combined to form disagree. Neutral and the spoiled questionnaires were put together to form neutral since they do not add any value to the results. The nine attributes were broken down into sub-attributes. From the results, all the nine attributes got a response of 50% and above with the lowest being 55.8% (feedback) and the highest being 74.2% (Personalizing learning). This gave the basis used in the design of the requirements framework for personalized learning with real-time feedback in e-learning system.

Proposed Basic Framework

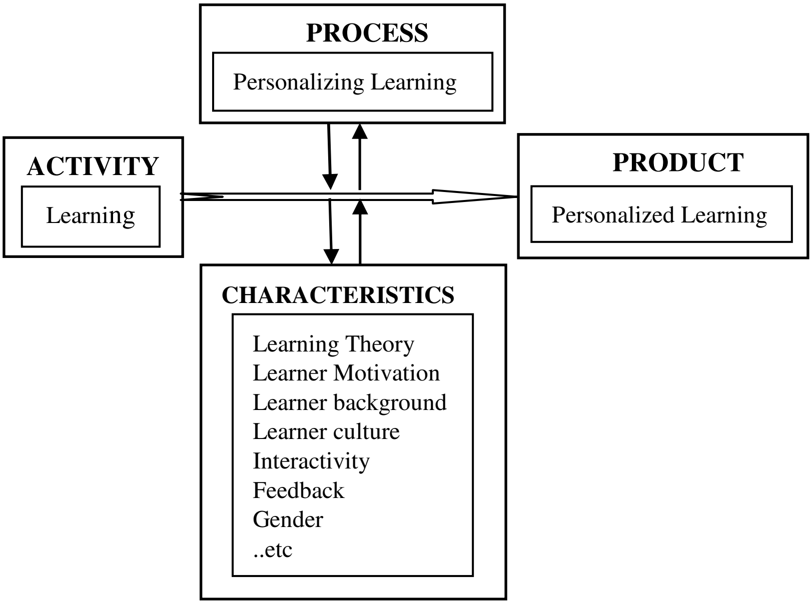

Fig. 2. The Basic Requirements Framework for Personalized real-Time Feedback in E-learning Systems

The proposed basic framework for personalized real-time feedback shown in Figure 2 is made up of four basic parts namely: activity, process, characteristics and the product. In this framework, learning is considered to be the activity; personalizing learning is the process, the individual learner preferences, differences, needs form what is known as the characteristics; while the end result which is known as the product is the personalized learning. Within these characteristics is one called real-time feedback that is necessary in a personalized interactive learning. Other characteristics may also be added on to this framework depending on the learner needs since they are dynamic.

6 Research Limitations

Much as positive results have been found from this study, there are some limitations that need to be looked at carefully. First the sample size was small and it is not representative enough. The results got from the students were validated by interviewing the lecturers together with the secondary data got from critical literature review using a short period. There is need for further validation of these results for an extended period of time using different students and interviewing experts from distance education and e-learning programmes.

7 Conclusion and Future Work

This paper presents work in progress where by personalized real-time feedback requirements framework for an interactive agent-based approach in an e-learning environment is proposed. The nine attributes identified were broken down into sub-attributes. From the results, all the nine attributes got a response of 50% and above with the lowest being 55.8% (feedback) and the highest being 74.2% (Personalizing learning). This gave the basic requirements framework needed for personalized learning with real-time feedback in e-learning system. A set of factors that affect real-time feedback in personalized learning process were identified. These factors improve the efficiency of e-learning environment; cater for the learner diversity and their varying learner needs. Future work can be directed towards the design of an interactive agent–based approach for real-time feedback generation in e-learning environment and its validation.

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The Trends in Mobile Learning

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Abstract. This paper reviewed research studies published on the topics related to mobile learning and investigate its trends. One hundred and five articles were selected based on a set of criteria. The contents were then analyzed, and results were summarized to highlight the key findings. The review revealed that there was an increase of mobile learning research studies being published, compared to two previous similar studies. However, comparable themes appeared: (1) the importance of strategic planning and implementation of mobile learning; (2) the need for effective instructional designs; and (3) mobile technology still has limitations. The conclusions of the findings may provide researchers or any interested educators with more information on the trends in mobile learning.

Keywords: Mobile Learning, M-Learning, Instructional Design.

1 Introduction

According to the Cisco Visual Network Index Global Mobile Data Traffic Forecast for 2011 to 2016, worldwide mobile data traffic will increase 18-fold during this time period, reaching 10.8 exabytes per month - or an annual run rate of 130 exabytes - by 2016. The expected sharp increase in mobile traffic is due to a projected surge in the number of mobile Internet-connected devices, which are expected to be more than 10 billion—exceeding the number of people on earth, which the United Nations estimates to be 7.3 billion by 2016. [1]

A recent survey conducted by the Pew Research Centre in the US showed that, as of 2012, some 78% of teens had a cell phone, and 47% of them (up from 23% in 2011) had a smart phone, 23% of teens had a tablet computer, while only 21% of adults had one; and 95% of teens used the Internet. [2]

The American Society of Training and Development (ASTD) in its ASTD-i4cp research reported that 65% of employers are either using, considering, or currently developing learning for mobile platforms. [3] More institutions are now integrating mobile technology into their academic curriculums so that their students can access course contents on mobile devices. Mobile learning is here already; their presence is expected soon to be ubiquitous.

This paper presents an overview of research studies published in 2012 peer reviewed journals focusing on the use of mobile technology in a learning environment. There were two studies published previously on reviewing literature

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 301–312, 2013.

covering mobile learning. Hung and Zhang used text mining techniques and bibliometrics analysis to examine literature published between 2003 and 2008. Wu et. al. who selected publications between 2003 to 2010. [4] A comparison between these two studies will be presented in a later section of this paper.

2 Definition of Mobile Learning

Mobile learning is defined as the method in which materials are delivered using mobile technology, such as mobile devices and wireless networks. Many define mobile learning as borderless, where learning can take place anywhere, anytime, as the learners will not be at a fixed, predetermined location as long as there is network connection available. [5]

Klopfer and Squire attempted to define mobile learning in 2008 when mobile smart phones were just in their infancy and handheld devices, such as PDAs, were gaining popularity. However, their definition covering the fundamental concept of a mobile learning space in the following five areas: (a) portability – can take the computer to different sites and move around within a location; (b) social interactivity – can exchange data and collaborate with other people face to face; (c) context sensitivity – can gather data unique to the current location, environment, and time, including both real and simulated data; (d) connectivity – can connect handhelds to data collection devices, other handhelds, and to a common network that creates a true shared environment; (e) individuality – can provide unique scaffolding that is customized to the individual's path of investigation. [6]

The eLearning Guild defines mobile learning as "Any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediated through a compact digital portable device that the individual carries on a regular basis, has reliable connectivity, and fits in a pocket or purse." [7] Geddes included the word, "knowledge", in his definition, whereas mobile learning is "the acquisition of any knowledge and skill through using mobile technology."[8] Mobile learning environments have been described as "human networks that afford the opportunity to participate in creative endeavors, social networking, organize/reorganize social contents, and manage social acts at anytime, anywhere through mobile technologies." [9]

3 Selection Criterion

Given the vast information available on the Internet, it is almost close to impossible to define the selection criteria. In order to set reasonable parameters for selecting the literature for this review, the author attempted to construct the following search parameters: (1) Publications must have appeared in printed or electronic formats between January 1, 2012 and December 31, 2012; (2) All publications must be in English; (3) Only those papers that were published in refereed scholarly journals or conference proceedings would be included. This excluded all editorials, book reviews, etc.; (4) One of the following phrases must have appeared either in the title or abstract: "mobile learning," "m-learning" or "mlearning"; (5) Full text must be available online; and (6) The contents must be relevant to mobile learning. Articles on applying learning theories in mobile learning would not fall within the scope of this paper. The search was done electronically on the University of Toronto Libraries website, using their articles search functions. A total of 5,600+ articles were retrieved from databases such as ProQuest, Wiley, ACM Digital Library, JSTOR, Elsevier, etc. Unfortunately, some articles from ERIC were not accessible due to issues of privacy and were blocked by ERIC. After further filtering using the criteria, there were about 364 articles that fit wtihin the criteria. Each article was then reviewed for its relevance. As a result, 105 articles were selected for the review.

4 Applications of Mobile Learning

In this section, selected research studies were presented to reflect the diversity of the mobile learning as published in 2012. This selected list also reflected the wide scope of research being done in mobile learning in different subject disciplines. Table 1 summarized the key elements of each study, including its geographical samples.

Table 1. List of Selected Research Studies

Source	Area of Application	Specific Device(s)	Sampling Size & Methodology	Country
Luanrattana, Win, Fulcher & Iverson	Medical Education	PDAs	15 medical school stakeholders [Interviews]	Australia
Chang, Yan & Tseng	English As A Second Language	PDAs	158 college students [Surveys]	Taiwan
Charitonos, Blake, Scanlon & Jones	Museum Learning	iPhones	29 Year 9 secondary school students [Surveys and Tweets analytics]	UK
Jain & Farley	Economics	VotApedia – Free mobile phone based application	400+ university students in economics [surveys and focus groups]	Australia
Alnabhan, Al-Saraireh & Matar	Learning Tools and Applications	HP 614c HTC p3300 Dell XPS Nokia N95	20 computer science students [surveys and focus groups]	Jordan
Cortez & Roy	English Language	iPod	5 advanced ESL university students [focus group]	Japan
Cingel and Sundar	English Grammar	Mobile Devices	288 Grades 6th to 8th Students [Surveys]	US
Muñoz-Organero & Muñoz-Merion	Computer Engineering	Mobile Devices	178 computer and engineering students [Course assignments]	Spain

Source	Area of Application	Specific Device(s)	Sampling Size & Methodology	Country
Tu, McIsaac, Sujo-Montes & Armfield	Social Presence	Mobile devices	14 graduate students [Participant observation and interview]	US
Wallace, Clark & White	Medical Education	iPhones	213 medical science student and faculty [Online survey and interviews of 18 participants]	Canada
Chen, Balijepally & Sutanto	Mobile Learning Experience	Tablet PC	32 undergraduate and graduate students [Surveys]	US
Liestel, Doksreod, Ledas & Rasmussen	Mobile Augmented Reality	iPad	200 school children and 8 senior citizen [Observations and surveys]	Norway
Narayan, Davis & Gee	Mobile Web 2.0	iPhone 4/iPad 2	36 university students [Surveys, focus groups, Web 2.0 data analytics]	New Zealand
Gromik	Mobile Video	Mobile Phone	9 language students [Video recording & surveys]	Japan
Alemi, Reza & Lari	MALL – Vocabulary Learning	Mobile Phone	45 English learning students [Text analysis, surveys & interviews]	Iran

4.1 Mobile Assisted Language Learning (MALL)/ESL

There were quite a number of studies published in 2012 on using mobile technologies in the areas of MALL and ESL. One of the obvious reasons mobile technologies are being applied in learning is that the learners found that these technologies are convenient; it has been proven that learners can access the knowledge anywhere, at any time. This was confirmed in a study conducted by Chang, et. al., with a group of 158 college students using PDAs to learn English. They concluded that "perceived convenience and perceived ease of use were the antecedent factors that affected perceived usefulness and attitude toward using." They also added that designers of mobile learning activities should be noted to "enhance the convenience and ease of use." [10]

Cortez and Roy's research focused on the usability of iPod screen interface as a language learning tool for a group of advanced English learning students in a Japanese technical university. Although the sample size was relatively small, with only five volunteers from the students, the analysis was an in-depth focus group discovery. The results supported the importance of a user-friendly interface design, as well as an effective use of games, listening and reading activities in language learning. [11] This finding continues to support the importance of instructional design for mobile devices.

Cingel and Sundar studied the impact of using mobile devices on texting and tweens for learning written grammar based on a survey of 228 6th to 8th grade students. Although it was obvious that the level of grammatical skills was different among the grade levels, the results "lend support to a general negative relationship between text messaging and adolescent grammar skills" and students who prefer text messages would likely use the technology more often. One of the findings was that most students were not able to "switch between writing text messages and using correct English grammar for class work." This leads to the need for further discussions on how school curriculum should be designed to fit the use mobile texting. [12] A similar study supported this finding and noted the practice design of contextualizing a MALL. [13]

Another study on using mobile devices in ESL learning "revealed that for learners with lower English levels, the presence of concurrent written text elicited higher performance efficiency in the immediate recall task of the English listening comprehension." [14] A smaller scale study looked into using mobile phone to produce a weekly 30-second video on a selected topic as part of a language learning tool. In the video performances, the participants suggested that this was an effective learning process that could increase the number of words they spoke in monologue. [15] Alemi, et. al. studied the effectiveness of SMS (short messaging service) on learning vocabulary based on the Academic Word List [16] and the results indicated that SMS had a more significant effect on vocabulary retention compared to using a dictionary. [17]

Huang, et. al. conducted a student on the mobile English learning, but focused on student knowledge acquisition, i.e. to investigate "the role of mobile technology playfulness, users' resistance to change and self-management of learning in mobile English learning outcomes (MELOs)." The empirical results of this study confirmed that "perceived playfulness and self-management of learning had positive influences on MELO and that users' resistance to change was negatively associated with MELO." [18] This further reflects the importance of the understanding needed to improve the effectiveness and efficiency of mobile learning.

4.2 Engineering and Science

Munoz-Organero and his colleagues conducted a study on "using mobile devices in class to provide students with contextualized learning pills" where the "pills" were defined as a "simple exercise that summarizes some of the key concepts explained in class and promotes reflection and self-study." As expected, implementing the "learning pills" via mobile devices did improve the class attendance ratio and student performance as well as motivational pattern. [19]

A group of 29 students from a secondary school in the UK visited the Museum of London and each one was given an iPhone to use Twitter to tweet their learning experience during the tour. The tweets were then analyzed. The results indicated that mobile learning using Twitter could “enhance the visitor experience and extend the social spaces in which learners interact with each other” and significantly improve “students’ impressions, participation and enthusiasm during the trip.” [20]

A free mobile phone based audience response system, VotApedia, was used as a tool to engage students in large students. The results confirmed the authors’ hypothesis that “VotApedia arouses student interest, encourages participation and inclusivity and allows tailoring of lectures to suit the student cohort instantly”; and “improves student engagement” (p. 437). The students surveyed were quite positive about their experience; on the other hand, overuse of VotApedia might lead to loss of interest; and the system was only available in Australia. [21]

Luanratta, et al. investigated the use of mobile devices, such as PDAs (personal digital assistants), in problem-based learning (PBL) medical education, and confirmed that PDAs “enable students to record and update their clinical experience…to have immediate access to clinical resources and information on-the-spot… and to communicate among peers…while offsite.” [22]

Wallace, et al. examined how medical teachers and learners are using mobile computing devices such as the iPhone in medical education and practice, and how they envision their being used in the future. They concluded that mobile technology “offers the potential to enhance learning and patient care, and also has potential problems associated with it.” This will have an impact on teaching methods in medical science and also present the importance of leadership in medical schools and healthcare organization to discuss ways to maximize the benefits of mobile technology. [23] This theme of organizational strategic involvements in the planning and implementation of mobile learning has also appeared in several other studies as seen below.

4.3 Mobile Learning Environment

Tu et al. conducted a study to understand mobile social presence and how it influences online interaction and relates to online social presence and network social presence. Using the participant observation method with a sample size of 14 graduate students in a US university, they concluded that “mobile social presence is similar to online and network social presences but is different from online and network social presences in the aspects of personalized control, and location-free digital interaction.” A model to build a digital social presence was presented in this study. [6] Another study found that students were more engaged in the learning process when using mobile web 2.0 tools. The learners felt encouraged; “self-regulation, nurtured a sense of ownership, creativity and innovation.” [24]

Based on a student-centric perspective, a study was conducted by Chen, et. al. to investigate if mobile technology had an influence on students’ learning experience. Selecting from one undergraduate and one graduate classes, the authors’ finding is that "the mobility features of technology appear to reshape the students' learning satisfaction and future expectation of technology." [25]

Liestol, et.al did a comparative study on how two age groups of users, senior citizens and school age children respectively, interacted with an iPad on a historical site with audio sound and interactive historical contents. They concluded that the "senior citizens, primarily interested in the subject matter, saw through the medium itself, while the school children were more focused on the mediation process itself, its new features and functions." [26] This interesting finding confirms the variances in mobile learning environment of users at different age groups.

Tortorella, et. al proposed an approach for "providing personalized course content in mobile settings" based on students' learning styles and context in order to provide them with the right level of personalized contents. [27] However, it is essential that the learning contents to be retrieved through the adaptation mechanism built in the learning management system are context-sensitive. [28]

5 Benefits of Mobile Learning

Is mobile learning the future classroom? Or will it change the dynamics of learning space? It has already been noted that a mobile technology learning environment helps empower students and provides new and exciting learning opportunities. [29, 30, 31]

Many research studies support the theory that using mobile technologies would enhance and improve the learning environment for learners. Mobile technology allows students to interact and collaborate with their peers, synchronously or asynchronously. They can share ideas using various digital forms, audio or video recordings, images, text, etc. At the same time, they can access the massive information resources on the Internet via their mobile devices.

Tracking of learners' progression is possible through the design of the mobile apps. This will help generate useful and powerful analytics in understanding learners' behavior and their patterns of usages. This will make adaptive learning much easier to implement and easier to understand the progression of learners and their learning experience.

Mobile technology has changed the method of learning and teaching in a traditional classroom environment. Like any type of technology, mobile technology can change rapidly, particularly in the design for various types of mobile devices. Adapting to this type of changing technology can be a challenge to many instructors, as they have to know how to develop support strategies when working with existing technology with the anticipation that this may be dated in a year or less. Even using the same tools, changes may occur over time due to the frequency of software upgrades and possible incompatibility between each upgrade.

On the other hand, mobile technology has already integrated into many students' daily lives. It is also important that the students will need to develop self-discipline and good skills to manage their time and behavior to avoid being side-tracked by the same tools used during the course. If not, the students will start using these apps for reasons other than course work.

Before using mobile technologies in a class, instructors must forewarn students of the potential distraction and advise them on the importance of self-discipline and time management so as to complete the required course work. Previous work has shown that personality traits and maturity in learning are likely to be equally important with computer literacy. [32] Success in mobile learning depends on the discipline and commitment of a student.

Research supports the premise that the use of mobile devices increased students' participations in their studies and engaged them in the classroom, for example, by using the interactive online voting system [33,34]. Mobile technology also provides students with convenience, connectivity, and portability. [35,36] However, as Merchant pointed out, mobile technology had already been encompassed in students' daily life and the most challenging issue to most educators "is to consider how educational experiences might be enhanced or transformed through the use of mobile technology." [37] This further confirms the needs of innovative mobile instructional design in order to offer effective and engaging contexts effectively in a small screen with appropriate bandwidth. It is also essential that institutions should "implement strategic efforts to build m-learning implementation plans, such as design guidelines, development phases and articulating norms, and consider the current level of students' readiness." [38]

The principle of mobile technology is that it is "always on" and accessible, as there is no closing time. The learners can complete the course at their own pace and on their own schedule. They can interact with each other—even when the instructors are not available—by using SMS, discussion boards, etc., and to learn collaboratively with Wiki-based forums. [27] Baloch, et al. studied mobile collaborative learning effectiveness using activity theory, even though further studies would have been needed. [39]

Another challenge in using mobile technologies is the Internet accessibility and bandwidth availability. The delivery of course contents to a mobile device is completely dependent on the reliability and stability of wireless networks, including coverage, bandwidth, etc. The speed of the connection has been an issue raised in several research studies, [40] where it was suggested that using more interactive, audio-video enhanced learning modules, would improve the effectiveness of mobile learning. However, this relied completely on the learner's mobile connections. If courses were made available to other countries, students could have difficulty accessing certain types of materials due to the country's government policies. In addition, depending on the Internet connection plan to which the learners subscribed, there might be additional network costs.

There are limitations in using mobile technologies, or any kind of technology. Battery life is always a challenge, as is the screen size, which must be overcome in order for course designers to effectively fit the course contents. However, a study confirmed that "contextualizing the use of mobile devices can promote students' attitudes toward the use of mobile devices in learning" when it was combined with the ambient artifacts. [41] With the right design for the contents for the mobile devices, mobile learning can still be as effective as other instructional technologies. [42] It is suggested that "content delivery needed to be spread out over more time", not only to compensate the smaller screen size, but engage students more in short messages, something that they are already accustomed to when using their mobile devices. [43]

Another challenge in mobile learning is the development of course materials that can fit in so many different types of mobile devices. Testing is easy to do on a desktop browser, as the size is manageable even with different browsers. But testing mobile learning materials requires the actual mobile devices. Although iOS and Android allow users to run simulated environments on a Mac or Windows-based system, it is still best to test it on actual devices. The rapidly changing devices will require regular upgrades and changes. This will incur additional development costs.

It has already been noted in a number of research studies that the importance of instructional designs contributed to the success of mobile learning. Creative and innovative applications should be made available as part of the mobile learning process. It has been considered as "traveling ideas in which the innovative idea of using mobile technology for learning purposes was tailored to the specific needs of the distance students" of a local university in South Africa. But the traveling idea was short-lived, as the course context kept changing in order to adapt the mobile technology of their students' needs. [44] On the other hand, Sung and Mayer found that there were differences in the perception of mobile devices between two countries, specifically South Korea and the US. Their findings were that "USA students were more sensitive to whether an instructional lesion is prepared on a mobile device or a personal computer, whereas South Korean students conceptualized both media as equivalent" while USA students tended to "have more positive beliefs for desktop computers, rating them higher than mobile devices compared [to] being fast, sharp, meaningful, good, and realistic; where South Korean students tended to have more positive beliefs for mobile devices, rating them higher than desktop computers on being open, attractive, changeful, stimulating, immediate, and exciting." [45] This study reflects the importance of context localization and cultural differences regarding the perception of mobile learning.

6 Conclusion

Using mobile devices as learning tools has received more attention as the technology becomes more accessible and popular with this generation of learners. Many educational institutions and corporations have already started using them as the primary tools, or allowing students to use these tools to access supplementary class materials. Gedik, et. al. discovered in their research that "m-learning can be considered to be more suitable for supporting f2f instruction." [40] Mobile learning allows the teaching and learning process to be individualized and encourages networking and collaboration among students while keeping them independent in contributing to the course content. This allows students to feel much more comfortable participating in an online collaborative environment. Mobile devices are considered personal tools as well as having the capability to support intense and ubiquitous cooperative learning, social interaction and sharing. [46] It is important to find ways to embrace mobile apps in learning and build a sound mobile learning integration with social network connectivity.

Mobile learning does not apply to all subjects, some which cannot be taught using mobile technologies, for example, technical IT materials, e.g. programming or SQL. [47] However, supplementary course materials can be made available on mobile devices for easy access and reference.

It is also found that numbers of articles stressed that a sound strategy is needed to best incorporate mobile technology into a curriculum and learning process with the focus of a creative, innovative and effective instructional design. [9,17]

Further research needs to be conducted to understand the effectiveness, levels of quality assurance and IT infrastructure support required in using mobile technology as learning tools. A large scale study is also needed to verify the feasibility of mobile learning in active curriculum development.

Mobile learning is here, and it is a choice of tools for learning of our next generation of students – the millennial students. The question then becomes, do we want to participate, embrace, and guide these learning activities, or do we want to ignore these activities as not part of the student learning process?

New technologies will always bring new users and create new opportunities for learning. If they are being used in the right way, technologies can engage learners, foster profound and meaningful learning, and result in an enriched learning environment. [48]

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Promoting Development and Use of OER: The Case of Open Educational Resources Consortium of Chinese Universities

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Abstract. The present paper introduces the OER in continuing education project which is undertaken by Open Educational Resources Consortium of Chinese Universities (OERCCU). The paper describes features of open courses, service and usage of OER, experience and lessons and challenges and next steps. Some related issues are discussed: importance of OER, quality assurance, facilitating meaningful learning with OER and sustaining viability.

Keywords: Open Educational Resources, Open Educational Resources Consortium of Chinese Universities (OERCCU), quality assurance, meaningful learning, sustaining viability.

1 Introduction to the Project

Open Educational Resources (OER) have been increasingly available all over the world in the last decade. A growing number of OER initiatives took place around the world. The potential of OER to increase access to education has been recognized by more and more countries and institutions. Ministry of Education of the People's Republic of China makes policies on OER and has developed several dedicated governmental OER action plans. Among them, Action of Open Digital Learning Resources for Continuing Education is prominent, which are undertaken by Open Educational Resources Consortium of Chinese Universities (OERCCU).

OERCCU is a non-profit association of Chinese universities, which was established in 2010. OERCCU's mission is to advance knowledge and education, and serve the society. It began with 103 universities in China. And Peking University takes the lead at OERCCU. The participating universities are organized to nine groups by their prominent disciplines. Two universities in every group are responsible for the group (See tab.1 OERCCU members and their duties)

The project provides free and open access to a selection of university continuing education courses. The aim of the project is to expand access to educational materials

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for all who wish to learn and promote the development and use of open sharing of advanced higher education and continuing education learning resources.

OERCCU promotes universities to work cooperatively offering courses freely online and provides abundant course materials meet a broader group of learners' need. These courses from member universities largely cover complementary disciplines, representing materials from leading institutions known for their work in their respective fields. These open courses are taught by distinguished teachers and scholars from participating universities.

Table 1. OERCCU members and their duties

Groups	The number of univ.	Head of universities	Duty and tasks
OERCCU	103	Peking University	Organize and lead member universities to undertake the OER project under the guidance of MOE of China
Group 1 focusing on philosophy and history OER	15	. Peking University . Renmin University of China	1. Make research on social needs for OER 2. Discuss course content and structure 3. Discuss the type of courses 4. Apply for develop courses voluntarily 5. Make arrangement for division of tasks 6. Design and develop courses 7. Submit the courses to OERCUU for review 8. Offer free courses online 9. Provide interactions among students and instructors
Group 2 focusing on agriculture OER	14	. Tsinghua University . Beijing Institute of Technology	
Group 3 focusing on science OER	15	. Peking University . China University of Petroleum	
Group 4 focusing on economics OER	11	. University of International Business and Economics . Central University of Finance and Economics	
Group 5 focusing on law OER	6	. China University of Political Science and Law . Peking University	
Group 6 focusing on education OER	8	. Beijing Normal University . South China Normal University	
Group 7 focusing on medicine OER	7	. Capital Medical University . Peking University	
Group 8 focusing on agriculture OER	8	. China Agricultural University . Beijing Forestry University	
Group 9 focusing on management OER	9	.Nanjing university .Tianjin university	
Group 10 focusing on literature OER	10	.Renmin University of China . Sichuan University	

2 Features of Open Courses

2.1 Websites of Open courses

Each member of the consortium offers selected courses on its own college platform. Meanwhile, OERCCU website provides all the open courses together by subject category and school category through the links. Anyone with access to the Internet can take all the courses at http://istudy.pkudl.cn/Index.aspx

The gathering of member universities' educational content together on one site enables learners to access the offered course content of any participating university from a single website. Learners do not require any registration to read or watch the courses on the websites.

2.2 Areas of Courses

As of Dec., 2012, OERCCU posted over 2000 courses freely online which cover a wide range of subjects in a perspective of lifelong learning. The open courses can be classified by professional courses and general courses which feature life-related topics.

The courses range from systemic knowledge-organized undergraduate courses to special subject-focused courses. Those courses span the full range of arts and humanities, social science, and natural science disciplines, including philosophy, economics, law, education, literature, history, science, engineering, agriculture, medicine, and management (See fig1 proportional distribution of open course areas)

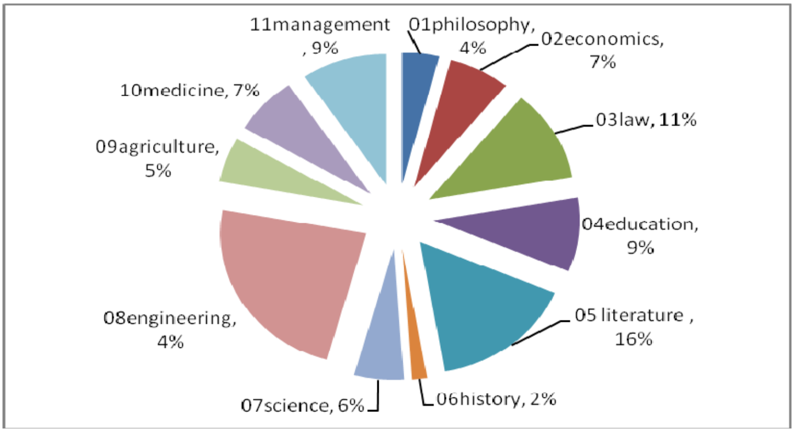

Fig. 1. Proportional distribution of open course areas

The life-related topics courses do not need any prerequisites for learners. Only with the interest in thinking through some issues we face in our jobs and everyday lives , a learner can take the course. And learners don’t need any other materials to take the course. As long as they got a computer to access the website, learners get ready to learn the materials.

2.3 Types of Courses

There are two types of courses free available. One kind of courses is video lectures which were recorded in college classroom and are available in video, audio, and text transcript formats. The lectures are available as downloadable videos, and an audio-only version is also offered.

The other kind of courses is full-online course which includes a full set of course items such as syllabi, lectures, suggested readings, problem sets, exercises and quizzes. See tab2.types of courses.

Table 2. Types of courses

Type of course	Description	User access
video/ audio course	video/ audio lecture, text transcript	1. Computer 2. IPad 3. Mobile phone 4. MP3
Full- online course	syllabi , video/ audio lecture, text transcript, readings, exercises, quizzes and other materials	

Note: at present, only a few of courses are conveyed on mobile phone or MP3

3 Service and Utilization of OER

The open courses are designed for a wide range of people, especially for self-directed and life-long learners. The Open Courses materials are provided for non-commercial purposes only. But no course credit, degree, or certificate is available.

The project made attempts to promote the use of OER. Currently, three types of OER services are provided：

(a) Offer OER alone to learners without access to other learners or instructors
(b) Offer OER learners with access to other learners
(c) Offer OER and quizzes and tutor instruction to learners

Most courses do not provide access to university faculty. Some university open course platforms support informal social interactions among learners, without any mentor or moderator.

At present, the project is designing “live access to professors online” activity to offer users the opportunity to ask the professor questions in selected courses. Learners are able to participate in class discussions in several ways.

Each week, there will be an optional live dialogue enabling students to interact with instructors and participants from around the country. Each lecture invites learners to respond to the regular questions related to the themes of the lecture. If learners respond to the question, they will be presented with a challenge to the opinion they have expressed, and invited to reply to the challenge. They can also, if they wish, comment on the opinions and responses posted by other students in the course, continuing the discussion.

In addition to the regular questions, the program contains a discussion prompt that invites learners to offer their view on a controversial question related to the lecture. If he wishes, another learner can respond to this question, and then see what other learners have to say about the argument he present. A learner can also comment on the opinions posted by others.

The OER courses are being used by lifelong learners and corporations. OER courses were visited more than two hundred million times till now in two years. Users expressed their enjoyment of learning courses. Survey shows that self-learners read OER for purposes below:

- ♦ Explore areas outside their professional field
- ♦ Review basic concepts in their professional field
- ♦ Keep current with developments in their field
- ♦ Complete a work-related project or task
- ♦ Connect with people of similar interests

See Fig 2 Flow of learning OER.

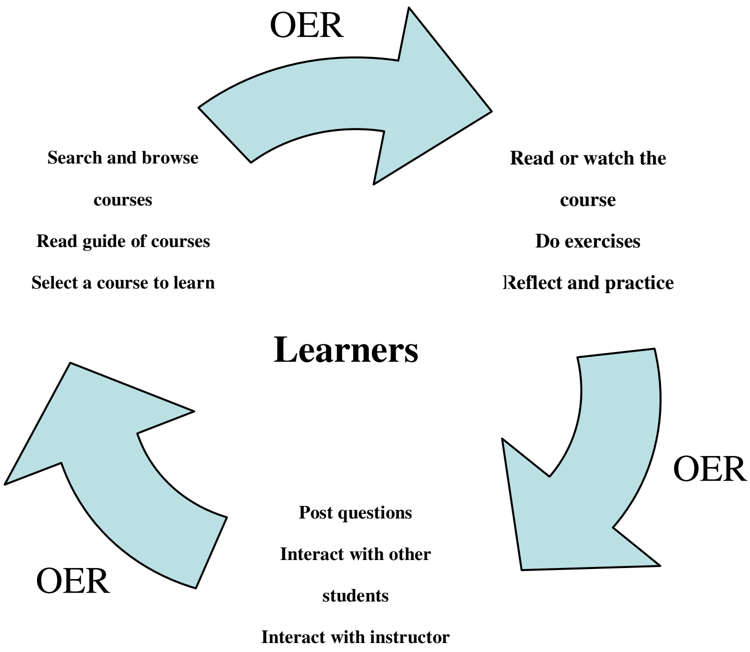

Fig. 2. Flow of learning OER

4 Experience and Lessons

4.1 Awareness of Importance of OER

Through the project, first of all, awareness of importance of OER has been deepened. Many institutions and faculty realized:

We are in time not only knowledge societies, but societies of shared knowledge. OER have potential to contribute to improving access to knowledge and to Education for All. The power of OER addresses the need to 'unlock knowledge 'and has an important role to play in increasing access to knowledge worldwide.

There is an ethical and moral obligation for institutions and academics to share their work and knowledge as widely as possible. Provision of OER is line with the academic tradition of a collegial sharing of information and knowledge and is congruent with the history and values of university. Through contributing course materials freely to the world, universities will further the teaching and public service missions of the university and fulfill their own commitment to the advancement and dissemination of knowledge.

There is the increasing demand for higher education and continuing education. OER play an important role to meet the evolving learning needs of the society. The OER movement offers one solution for extending the reach education and expanding learning opportunities. It contributes to making education more accessible, especially where money for learning materials is scarce.

The creation of OER is not an additional burden but rather an integrated part of the scholarly endeavor which has a great meaning to a faculty member's own teaching, scholarship and career. Open sharing and collaboration offer real potential for enhancing both teaching and learning.

4.2 Quality Assurance for OER

Quality assurance of OER is the key to OER's sustainable development. Quality culture is as important as share culture. There are two ways to make sure of quality assurance of OER. One is internal QA measures which OER's providers take. The other is exterior QA measures which third parties take.

OERCUU takes measures to make quality assurance of development of OER. OERCUU made academic standards and technical standards for OER. The university who provides OER is responsible for evaluating the good quality of its open courses according to the standards. Many universities make quality-based work flow and guideline from construction、 publication、 application、 and to assure qualified ,sharable educational resources. Many universities make OER peer reviewed. Updating is required. OERCUU make monthly investigation and evaluation. And join-and-quit mechanism is made.

5 Challenges and Next steps

Many challenges remain, however. In one way or another, all of the challenges relate to ensuring the long-term vibrancy and sustainability of OER. Key considerations include the following:

5.1 Facilitating Meaningful Learning with OER

With the project, the main challenge is to facilitate meaningful learning with OER content. From the start of the project, we are concerned about how much actual learning a learner would be able to accomplish using the OER materials. OER is worthwhile only if our users continue to find it useful and usable for their learning purposes.

We are planning to make studies of user experiences with OER, and experiment with new user support mechanisms. A platform is needed to allow users to ask and answer questions concerning OER content. We will create a community of open learning to support learners' interactions around OER and increase their understanding of the material. It will also give the user a wide variety of other options for structuring the learning process, for example downloading, redistributing, and remixing course materials.

Furthermore, we will design blended learning approach to integrate OER into continuing education and training programs.

And we will explore an evaluation program to ensure that we are fulfilling the OER mission and meeting user needs and expectations.

5.2 Sustaining Viability of OER

With the project, the other challenge is sustaining viability. Sustaining the OER project is a complex undertaking, which contains many issues and variables. Two issues are highlighted here: (a) Institution and staff motivation and (b) collaboration of all stakeholders and devotion from the society.

(a) Institution and staff motivation:

As the project went beyond the start-up innovation to the further progress, it became important to sustain the excitement of the OER idea and keep institution and staff motivated and challenged. We foster continued institutions participation and encourage them to keep their published courses up to date.

The key component of OER is the educational content, and the essential source is the instructor who provides that content and agrees to make it freely and openly available. The creation of the original educational substance depends upon faculty members.

There are some measures of incentives for faculty members to take part in the OER project:

- ♦ Expanding the existing recognition and reward systems of the higher education community.

♦ Giving priority to linking the development of OER to faculty's career advancement.

♦ Adding OER to staff's portfolio that is displayed for the academic promotion and tenure.

♦ Implementing institutional policies that encourage open educational resources, and valuing the creation of open materials.

(b) Collaboration of all stakeholders and devotion from the society

Meanwhile, to succeed, OER will require many creative people willing to both contribute and make use of the resources. Although there is a growing awareness of OER, there is still the need to explain and promote the whole society's awareness of OER through all appropriate channels.

OER will be more useable and more relevant if the whole society, especially the entire education community – not just institution and faculty – were engaged in developing modules and adapting them to new situations. Creating the society as an environment of collaboration of OER will make OER more effective.

All stakeholders including academics, higher education institutions, national government, regional or local government, higher education funding bodies, foundations or other grant-making organizations, professional and academic organizations, technology companies, publishing and media companies, regulatory and accreditation bodies, OER associations, non-governmental organizations, international organizations should be actively involved in OER.

And we should explore more models to increase the capacity of individuals, institutions, and organizations to create and use OER. Financial support cannot be ignored. From the start, OERCUU depends on limited funding from MOE to operate. Every member university makes his own investment of the development of OER. As the initiative begins to transition to a steady-state operation today, expectation of ongoing funding becomes even more challenging. It's necessary to secure financial resources for OER initiatives. Long-term economic sustainability models need to be explored.

6 Epilogue

OER have been an important part of the education ecosystem. OER materials are currently being used in two different types of knowledge environments: (a) people learn OER content and (b) people modify the OER content, improve it in the process and repost it online to others. The ultimate end of OER is recreating knowledge. The meaning of OER lies in shifting the philosophical underpinning of OER from 'knowledge for all' to 'construction of knowledge by all'. OER create the kind of participatory culture of learning, creating, sharing and cooperation that rapidly change knowledge societies' need. OER will bring people of all backgrounds together and promote mutual understanding. In the ideal atmosphere of OER, there is no "provider" or "user", and everyone can devote to creation, organization, dissemination and utilization of OER. We should create a world where each and every person on earth can access and contribute to the sum of all human knowledge, as it is described in The Cape

Town Open Education Declaration. The project of Chinese University OER in continuing education is still in the initial stage. We have a long way to go on the OER route.

Acknowledgement. This paper is one of phasic results of the study item titled by *Development and use of Open Digital Learning Resources for Continuing Education Study*, funded by Ministry of Education of the People's Republic of China, Year 2011-1013.

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Analysis on Instructional Features of Quality Video Open Course

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Abstract. Quality Video Open Course (QVOC) is a significant part of the *Project on Teaching Quality and Reform in Higher Education* during the "12th Five-Year Plan". Firstly, the study is purposed to explore the instructional features of QVOC by the means of content analysis from three aspects, such as topic, video scene and instructional design. Secondly, it is aimed to point out the communication features of QVOC by Internet. The result indicated that the topic was not only of some native characteristics, but also focused on learners' personal development; the video scene had concise composition, gave prominence to the key points, conformed to the learners' cognitive development; instructional design was flexible; it was open and free in communication, and provided humanized learning supports.

Keywords: Quality Video Open Course, Instructional Features, Topic, Video Scene, Instructional Design, Communication.

1 Introduction

Quality Video Open Course（QVOC）is the online video course and academic lecture on science and cultural literacy which serves for university students, being free to the public [1]. In 2011, QVOC was initiated by Ministry of Education. Up to December in 2012, 186 video open courses have been broadcast on some websites, such as “Icourses”, “CNTV” and “Netease” etc, making majority of users be highly concerned. Meanwhile, more and more university teachers propagated their courses via Internet, with the aim to promote socialist core value system, mainstream culture and scientific theory, and widely spread the outstanding achievements of human civilization and the frontiers of modern science and technology through advanced education philosophies and methods. These courses can not only improve the scientific and cultural consciousness of university students and social public, but also enhance Chinese cultural soft power and the influence of Chinese culture.

2 Question

There have been many correlational researches about Open Course Ware (OCW) in foreign countries, which mainly focus on the construction, application and

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sustainability of open courseware. As to the construction, some object models and design framework were emphasized to standardize and promote the open courseware; it's also pointed out to be short of the teaching practice and economic cooperation in the construction process [2], [3]. The studies about its application indicated that the application domain could be extended and the using method could be diversified [4], [5]. Studies about the sustainability in open courseware were mainly concerned with its sustainability in the perspectives of technology, content and finance. David Wiley (2007) explored project content and funding models to improve the sustainability [6]. Yannis Dimitriadis (2009) pointed out some learning or pedagogical patterns contributed to improving the produce cycle of OER from a cultural historical activity theory perspective [7]. Stephen Downes (2007) interpreted how to promote the sustainability of OER from technology model, content model and funding model [8]. All above studies are partly involved with OCW but they are short of special systemic analysis on the feature of OCW.

QVOC, the open educational resources similar to OCW, has achieved initial results in the past two years in China. At present, the related studies mainly focus on two aspects: the development of video course and the reflection of project construction. Researchers emphasized the new concept, effective process to develop the excellent course. Wang Jian (2011) analyzed the development and content design of course from video technology [9]. Song Jiangong (2012) proposed to design and develop the teaching video based on the humanized concept [10]. Some studies about the construction of project analyze its construction mechanism and quality to find effective ways to improve the QVOC. Liang Chao (2013), Dong Rong (2012) and Zhang Kai (2013) pointed out that instructional design, effective mechanism and topic were three considerable parts to be thought out when the QVOC was developed [11], [12], [13]. Ke Jiahai (2012) suggested we should highlight its local characteristic and emphasize the communication mechanism and evaluation of the project [14].

However, there are few special systemic studies about instructional feature, which contribute to discovering and solving underlying problems to improve the construction and application of the project. At present, lacking this study discourages the public recognizing it and prevents researchers from mining question and deepening their study about QVOC in China. So we set out to conduct this study.

3 Research Design

Combining the definition of instructional features and the characteristics of QVOC, we suggest that instructional features in QVOC should be mainly analyzed from four aspects: topic, video scene, instructional design and its communication. Topic reflects curriculum goals and content; QVOC presents teaching activities by video scene, giving expression to the activities of teachers and students; instructional design reflects the selection of instruction media and the application of instructional strategies; its communication is open and free, being carried on special websites.

3.1 Research Method

Content analysis is a process of mapping data from sources such as textual reports into a data matrix suitable for statistical analysis [15]. This study is attended to analyze systematically the topic, video scene, and instructional design of QVOC according to the analysis rubrics, so as to explore the instructional features of QVOC. In order to guarantee the reliability and validity, we have three members taking part in the work of analyzing and evaluating the corresponding content.

3.2 Sample

Since QVOC was initiated by Ministry of Education in 2011, 186 Video Courses have been free to public till December in 2012. Each course consists of five videos at least. According to the different analysis aspects, different samples were selected (Table 1):

Table 1. Sample of content analysis

Content Analysis	Research Sample
Topic	186 courses
Video scene	30 lessons, (selecting 1 lesson from each of 30 courses)
Instruction design	30 lessons, (selecting 1 lesson from each of 30 courses)

4 Analysis on Topic in QVOC

4.1 Analytical Process

Course construction mainly focuses on the educational curriculum and academic lecture about modern science and splendid culture with strong influence and wide communication [16], paying attention to the construction of Traditional Chinese Culture (CTC), Science and Technology (ST), Social Issues (SI), University Public Course (UPC), University Basic Course (UBC). Based on the division of the disciplines in QVOC, we formulated the topic analysis rubrics (Table 2).

Table 2. Topic analysis rubrics in QVOC

Analysis rubric / Discipline	CTC	ST	SI	UPC	UBC	Subtotal
Literature and Art						
Philosophy and History						
Economic Management and Law						
Basic Science						
Engineering Technology						
Agriculture ,Forestry and Medicine						
Total						
Ratio						

4.2 Data Analysis

Based on the topic analysis rubrics in QVOC, we got the topic distribution chart (Fig.1).

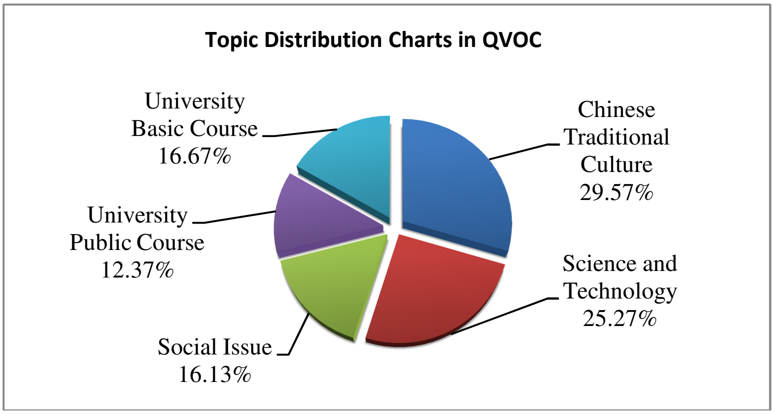

Fig. 1. Topic distribution charts in QVOC

As is shown in Fig.1, the topic of QVOC fastened on the Chinese traditional culture and the advanced science and technology. Furthermore, in order to cater to social concern and learner's interest, the hot and popular courses were selected to launch. Specifically, the topic of QVOC has the following characteristics:

Native Characteristics
Seen from Fig.1, topics on CTC and ST account more than other courses. This echoes the original intention that QVOC disseminates the outstanding achievements of human civilization and the frontiers of modern science and technology. This grasped its core functionality. The topic on CTC occupies the largest proportion, which highlights that QVOC aims to put forward Chinese outstanding traditional culture, with distinctive native characteristics.

Practicality
The topics on SI and UBC occupy a certain proportion with 16.13% and 16.67% respectively. Both are deeply relative with real life. In addition, the topic of QVOC covers broad discipline to meet students with different learning backgrounds and public learners' needs.

Learning Development
Among the five kinds of topics, the proportion of UPC was the least, with only 12.37%. As UPC mainly included political theory and moral lessons, the audience was not so broad as the other courses. However, in terms of existing courses, this

topic attaches great importance to mainstream culture and learner's personal development.

5 Analysis on Video Scene in QVOC

5.1 Analytical Process

QVOC is the video presentation of teaching activities in colleges, which includes teachers, students, purpose, content, methods and media [17]. In order to render the course better, the video scene of QVOC focused on presenting teacher activity, student activity, teacher-student interaction and multimedia PPT, as well as the teaching case. In this study, we made a statistical analysis on the runtime of the video scene and formulated analytical rubric (Table 3).

Table 3. Analytical rubric of video scene in QVOC

Video Scene	**Time-Period**	**Ratio**
Teacher activity		
Student activity		
Teacher-student interaction		
Multimedia PPT		
Teaching case		
Total		

This study adopted stratified sampling and random sampling method to select 30 lessons from 30 courses, which included 9 courses in CTC, 7 courses in ST, 5 courses in SI, 4 courses in UBC and 5 courses in UPC.

5.2 Data Analysis

According to the analytical rubrics above, we conducted the content analysis on 30 teaching videos. The research recorded the runtime of one scene before it switched to other pictures. Then we added up the runtime of each kind of scene to analyze their instructional features. The statistical results are shown in Table 4.

Table 4. Analysis results of video scene features in QVOC

Video Scene	**Time-Period**(s)	**Ratio**
Teacher activity	37542	68.39%
Student activity	3196	6.55%
Interactive activity	13731	0.73%
Multi-media PPT	389	23.37%
Teaching case	386	0.96%
Total	55244	100%

It's surveyed that every video's average period is about 30 minutes, which can reduce students' distractions because the time-period is fit for learners' cognitive development.

As the results above shown, the picture of teachers' activity takes the largest proportion, while the least proportion is the interactive behavior between teacher and students. The obvious differences reflect that QVOC stresses the delivery of knowledge rather than the performance of students or teachers.

The video pictures mainly present some following characteristics: simple composition and single scene; most of the scenes appear to be static and show medium shot; pictures switch timely among five video scenes. The simplicity of video complies with the teaching regulation, which can avoid distributing learners' attention.

In addition, different courses differ in the runtime of the video scene. As is shown in Fig.2:

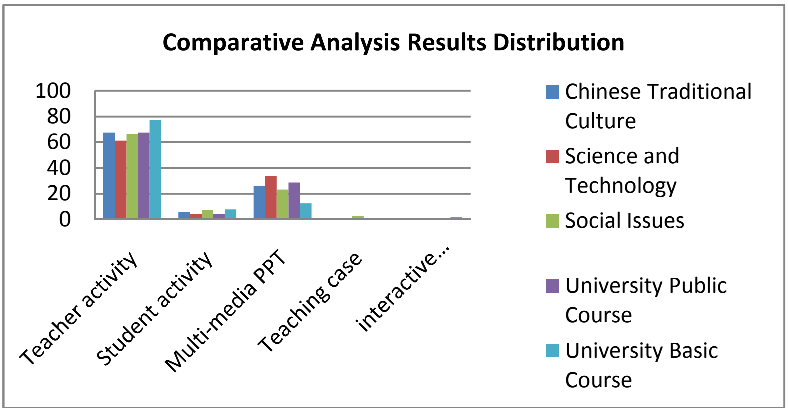

Fig. 2. Comparative analysis results distribution

Seen from Fig.2, the runtime of PPT has the biggest difference in five courses. ST has the largest portion, with UBC using it least. Compared to UBC, the course in ST is hard to understand, the PPT are usually adapted to present learning content. The picture time-period of teachers' activity has the least difference in five courses. According to the comparative analysis results, we figured out that the teaching video followed the disciplines' law, and didn't fix on the same model.

6 Analysis on Instructional Design in QVOC

6.1 Analytical Process

As to instructional design, different people have different understandings. The concept of Instructional Design put forward by He Kekang was mostly accepted. He considered that "Instructional Design is the systematic process of designing instructional objectives, condition, method and evaluation on the basis of learning theory and instructional theory by using systematic method" [18]. Since the main orientations of instructional objectives are alike due to the guiding principles. Consequently, analysis rubrics on instructional environment, instructional media and instructional strategies were given according to the concept of instructional design and the fact of QVOC (Table 5).

Table 5. Instructional design analysis rubrics of QVOC

Analysis rubric	Courses	Result（Num）	Ratio
Instructional Environment	Classroom Studio Conference hall		
Instructional Media	Blackboard/Whiteboard Computer and Projector Interactive electronic whiteboard Integrative equipment of multimedia Material object/Model		
Instructional Strategies	Lecturing Teaching Heuristic Teaching Case-based Teaching Demonstration Teaching Scene Visit Conversation Reading Guidance		

6.2 Data Analysis

Instructional Environment

As is well known, instructional environment is composed of physical and social environment. Accordingly, we got the analysis result of instructional physical environment in QVOC (Table 6).

Table 6. Analysis results of instructional environment

Analysis rubric / Course	Result (Num)	Ratio
Classroom	19	63.33%
Studio	5	16.67%
Conference hall	6	20.00%

Seen from Table 6, compared to studio and conference hall, classroom appears more commonly. In fact, each kind of instructional environment has its feature: it may be convenient to record and edit teaching video in studio; conference hall could contain more learners; classroom could be equipped with all the required teaching facilities. Classroom is the most common because learners who watch QVOC can feel the sense of real learning environment.

Instructional Media

Instructional media refers to means of information communication in the teaching process, used in teaching activities [19]. Instructional media used in QVOC not only includes modern media but also involves traditional media. We concluded the following results in Table 7 through analysis:

Table 7. Analysis result of instructional media

Course / **Analysis rubric**	**Result** (Num)	**Ratio**
Blackboard /White board	5	16.67%
Computer and Projector	21	70.00%
Interactive Electronic Whiteboard	0	0.00%
Integrative Equipment of Multimedia	8	26.67%
Physical Model	1	3.33%

Seen from Table 7, the combination of computer and projector is the most common in QVOC, especially in classrooms and conference halls, taking up 70%. Integrative equipment of multimedia has the percentage of 8, mainly used in studio. Blackboard and physic model are still applied, but much less. In general, the application of media in QVOC matches with instructional law and video's feature. Furthermore, its application in QVOC presents various combinations.

Instructional Strategy

Instructional strategy is diversified and flexible, so most courses combine a variety of instructional strategies in QVOC. In terms of instructional strategies, they are chosen by teacher according to special instructional objective, including arranging all kinds of teaching methods and learning resources [20]. Therefore instructional strategy is specific implementation procedure. From the instructional strategy analysis of QVOC, we can conclude these following characteristics:

Lecturing Teaching as dominating part.

Because QVOC is conveyed by video, when choosing instructional strategies, we should not only consider instructional activities, but also take into account the nature of video. The analysis result could be shown in Table 8.

Table 8. Analysis result of instructional strategies feature

Course / Analysis rubric	Results (Num)	Ratio
Lecturing Teaching	28	93.33%
Heuristic Teaching	12	40.00%
Case-Based Teaching	11	36.67%
Demonstration Teaching	2	6.67%
Scene Visit	1	3.33%
Conversational Method	9	30.00%
Reading Guidance	1	3.33%

Seen from Table 8, the common instructional strategies of QVOC include the Lecturing Teaching, Heuristic Teaching and Case-Based Teaching. QVOC tends to deliver knowledge by Lecturing Teaching, guide students to think by Heuristic Teaching. In sum, the Lecturing Teaching is still the dominating part, a varietiy of methods being combined.

Flexible combination

QVOC is the high-class course to be chosen according to attractive teaching content and various teaching activities. Because the effect of teaching activity depends on instructional strategies to a great extent, it's necessary to analyze their application. In order to do some further studies, we chose five lessons to analyze. As is shown in Table 9:

Table 9. Typical instructional strategies in QVOC

Course / Instructional strategy	Tea Culture and Tea Health（CTC）	Science Information Technology Icon（ST）	Mathematical Culture（UPC）	Modem Etiquette（SI）	Contemporary Philosophy（UBC）
Lecturing Teaching	✓	✓		✓	✓
Heuristic Teaching		✓	✓	✓	
Case-Based Teaching				✓	✓
Conversation	✓		✓		✓
Reading Guidance		✓			

Seen from Table 9, various instructional strategies are combined flexibly in QVOC. For example, Lecturing Teaching, Heuristic Teaching, and Case-Based Teaching are combined in *Modem Etiquette*, which can control class paces and adjust the learning psychological state of learners.

The innovative application of instructional strategies is also noticeable. Some courses integrate Heuristic Teaching with Lecturing Teaching, in which teachers lecture their own understanding in order to enlighten students' thinking. For instance, *Contemporary Philosophy* and *Tea Culture and Tea Health* use the method of Heuristic Teaching felicitously, in which teachers adopt comparative way to analyze teaching content and guide student's multi-thinking. Some courses guide learners to solve questions by Case-Based Teaching, such as *Mathematical Culture*. A few courses adopt the method of visiting to expand their teaching space and support students' physical observation. Besides, Reading Guidance is applied to recommend relative books and explaining reading skills. The course of *Science Information Technology Icon* passes the idea of design by combining Reading Guidance and Lecturing Teaching.

7 Analysis on Communication of QVOC

7.1 Network Platform

Currently, the QVOC in China mainly run on four network platforms, such as "Icourses", "Courses in China Network Television", "the NetEase University Video Open Course" and "China Quality Course Resource Network". They are free and open to the public synchronously. Here are the homepages of the platforms.

Fig. 3. Homepages of the four network platforms

7.2 Communication Features

Compatible Advantages

The communication means of QVOC combine characteristics of mass communication and interpersonal communication. By means of mass communication, the majority of learners can access the video courses simultaneously. As to the means of interpersonal communication, learners of QVOC can give feedback to the communicators, and they can learn from each other. Therefore, the communication of QVOC has both the advantages of mass communication and interpersonal communication, which breaks the limitations of interpersonal or mass communication.

Learning Supports

QVOC was spread through special websites, with the objective of sharing and exchanging information. Commendably, it was matched with abundant learning supports. The characteristics of support services in QVOC mainly present three aspects. Firstly, it's convenient to choose the specific course. The network platforms provide a combination of indexes, including full-text search engine and directory search engine, to facilitate the learners to access the courses. Secondly, it was armed with humanized learning operation. The four platforms above all provide the function of "Point Recording". When interrupting the video or restarting it, the video will be prompt to get the last watched point. In addition, QVOC is communicated in an active learning environment. In the module of comments, learners can express their viewpoints and share information to form a learning community, which creates an active learning environment.

8 Conclusions

After analyzing the instructional features of QVOC by the means of the content analysis approach in this study, we could draw some following conclusions. Firstly, topic in QVOC closely focuses on carrying forward the excellent and marvelous traditional Chinese culture. It pays attention to different learners' development needs and underlines on making close contact with real life. Secondly, video scene in QVOC conforms to the learners' cognitive development. The video pays attention to the timely transition between different lens and its picture composition is simple. Furthermore, Instructional Design of QVOC stresses combination of different elements. For example, it focuses on flexible combination of instructional media and instructional strategies according to specific situations. In addition, an obvious feature is that it's open and free in communication, which is armed with humanized learning supports. All above reflect its instructional features, which can help us recognize QVOC and facilitate its own advancement.

Meanwhile, we have also found the topic and instructional design in QVOC are short of elaborate development and effective application. For example, UBC occupies low proportion, which cannot satisfy fully university students to understand relevant major knowledge systematically and master the progress and evolution of the discipline timely; teachers adopt traditional teaching more often, using rather less heuristic teaching and other instructional strategies etc.

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Student Acceptance of Electronic Schoolbag Systems: An Empirical Study in China

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Abstract. Advances in mobile technology create a novel way in mobile learning. The electronic schoolbag (e-Schoolbag) system represents the future of mobile learning. The introduction of the e-Schoolbag system will rapidly spread all over the world. This study tries to study the student acceptance of the e-Schoolbag system by extending the UTAUT model with the consideration of a critical element "political influence". A Partial Least Squares (PLS) analysis is used to analyze the data collected from 300 students in Mainland China. The results of this study indicate that political influence is an important factor followed by ease of use factors that influences the behavioral intention for students to adopt the e-Schoolbag systems. This study contributes a research model for the study of technology acceptance in institutional contexts and provides recommendations for governments and colleges to formulate their strategies to motivate students to adopt e-Schoolbag systems for ubiquitous learning.

Keywords: mobile learning, technology acceptance, political influence, UTAUT, electronic schoolbag.

1 Introduction

Information Technology (IT) has made a great impact on educational reform [1]. It has changed learning methods, classrooms as well as learning technologies [2,3]. Mobile learning has recently become noteworthy because mobile devices have become popular [4]. Mobile learning is referred to a service or facility that supplies a learner with general electronic information and educational content that aids in acquisition of knowledge regardless of location and time [5]. A mobile learning system provides a flexible learning environment whether studies take place on campus, at home or outside the university [6]. An electronic schoolbag (e-Schoolbag) system is a mobile learning system that is acted as a data collection centre of inputs from notebook, teaching material, weekly report, contact book, exercise, and other classroom activities [7]. It enables students to keep the track of their learning process, understand their learning efficiency, and overcome their learning disability [8].

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Furthermore, the adoption of e-Schoolbag not only reduces the heavy burden of students, but also meets the purpose of environmental protection [9]. Doukas et al. [10] forecasted that students will soon have a light-weight portable e-Schoolbags that can wirelessly connect to the interactive digital classroom system.

The concept of a mobile learning system is not new. Kravcik et al. [11] developed a mobile learning application called Mobile Collector in 2004. It was designed for gathering data and writing down annotations in collaborative activities on field trips. However, studies of mobile learning applications are still rare in the pedagogical literature and there are few studies on the student acceptance of e-Schoolbag systems. More research is needed to explore the potential of the adoption of mobile learning applications, as well as e-Schoolbag systems.

Many technology acceptance models were developed to expound mutual relationships of factors influencing acceptance within emerging technologies and systems [12,13,14]. Venkatesh et al. [14] integrated eight models of technology acceptance into a Unified Theory of Acceptance and Use of Technology (UTAUT) that represents a significant step forward in the technology acceptance literature. However, when considering the promotion of e-Schoolbag systems, government support should be an important factor in the adoption of e-Schoolbag systems. Therefore, this research studies student acceptance of e-Schoolbag systems by extending the UTAUT model developed by Venkatesh et al. [14] with a consideration of the critical element of “political influence”. The results of this study provide recommendations for governments and colleges to formulate strategies to motivate students to adopt e-Schoolbag systems.

2 Literature Review

2.1 Electronic Schoolbag Systems

Mobile technologies can enhance the learning environment and it is envisaged that the e-Schoolbag systems as a new instruction or learning method will break through the limits of traditional education to encompass the future of mobile learning [15]. Hitherto studies of the design and development of the e-Schoolbag systems were limited.

Hsu and Chang [16] described that the learning models of electronic Schoolbag systems including: electronic book, digital knowledge, paragon teaching materials, exercise book, notebook, toolbox, parents contact books, weekly report, pencil case, writing materials, sheets, calculator, and address books. Through the use of e-Schoolbag systems, students can download or upload their homework, along with teachers’ notices and exercises; they also can communicate with their teachers anytime and anywhere. The e-Schoolbag system facilitates dynamic interactions between teachers and students. Therefore, students can take lessons in a lively, vivid, and novel learning environment, leading to enhanced students’ learning experiences.

Chang et al. [8] designed an e-Schoolbag system that consists of learning flow design module, upload/download module, video management module, audio management module, note-taking module, file exchange module, chat module, presentation module, and grading module. They conducted a study with 71 students and concluded that e-Schoolbag systems enable students to quickly retrieve knowledge resources and rapidly apply relevant knowledge in problem solving situations. The adoption of this technology increases interactivity among learners and between teacher and learners, and its high interactivity meets the pressing demand of learners to learn; it also offer learners opportunities to exploit the potential of active learning through the construction of authentic knowledge.

Recently, Fang et al. [15] argued that e-Schoolbag systems have three features: learning support, learning equipment, and learning service. Learning resources in a e-Schoolbags system provide leaning support for students that include edited electronic textbooks, support tools for learners and relevant supplements. The e-Schoolbag system is a kind of mobile learning facility that includes a variety learning support resources and forms of network access. Through the learning service functions of e-Schoolbag provision, learners interact with the systems by means of selecting learning content in accordance with their own needs and often via the completion of personalized quizzes.

Many scholars have forecasted that e-Schoolbag systems will spread rapidly worldwide; studies of the application of these technologies are limited, especially with regard to student acceptance.

2.2 Technology Acceptance Models

Several models in the literature have been developed in order to explain individual technology adoption. The main models are the Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM). Arguing from a social psychology perspective in, Fishbein and Ajzen [17] defined TRA as comprising two main determinants: namely attitude toward behavior and the subjective norm. Attitude toward behavior is an individual positive or negative feeling about performing the desired behavior. Subjective norm is an individual's perceptions of whether or not other people who are important to him think he should or should not adopt the behavior in question. Both the attitude towards a specific behavior and subjective norm have an impact on behavioral intention, which in turn determines actual behavior. Intentions are assumed to capture the motivational factors that influence a behavior, and thus indicate how hard people are willing to try or to what extent they are planning to make an effort, in order to perform the behavior [18].

Inspired on the TRA, Davis [12] proposed the TAM in 1986, which includes constructs of perceived usefulness, perceived ease of use, intention to use, and actual system usage. TAM was the first model to mention psychological factors affecting computer acceptance. Perceived usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance. Perceived ease of use is the degree to which a person believes that using the system will be free of effort. Behavioral intention to use the system is defined as a function of attitude and usefulness and thus behavioral intention determines actual usage behavior. In 2000, Venkatesh and Davis [19] enhanced the TAM to TAM2, which includes subjective norm construct as a new determinant. Both TAM and TAM2 have been applied in different forms to explain technology adoption in a wide variety of contexts which include virtual learning, mobile learning, and electronic textbook contexts (e.g., [20,21,22,23,24]).

In 2003, Venkatesh et al. [14] developed the UTAUT model to consolidate previous TAM related studies. The UTAUT model consists of four core determinants (performance expectancy, effort expectancy, social influence, facilitating conditions) and four control variables (gender, age, experience, and voluntariness of use). It accounts for 70 percent of the variance in technology use. After its introduction, many researchers tested and applied the UTAUT model in different technological contexts. In the education context, Jairak et al. [25] applied UTAUT to the study student acceptance of mobile learning for higher education in Thailand; Wang et al. [26] used UTAUT to investigate the determinants of m-learning acceptance in Taiwan and to discover if there exist either age or gender differences in the acceptance of m-learning.

2.3 Political Influences

Government is the driving force behind information technology is it takes a large participatory role in the development and diffusion of IT in a given country [27]. An educational computing policy is to guide a major and costly educational innovation characterized by managerial rhetoric, confused conceptual thinking and no substantial notion of the social relations of such an important and influential innovation [28]. Well and Rosen [29] argued that a supportive political climate is a factor influencing the successful integration of computer technology in universities. Rogers [30] suggested that political influence is expected to influence technology acceptance behavior. Thus, in this study, political influence is considered as a critical factor for the adoption of e-Schoolbag systems for ubiquitous learning.

3 Research Method

3.1 Research Model

In general, “perceived usefulness” and “perceived ease of use” have constituted a significant influence on an individual’s intention to use a technology or system [31,32]. Performance Expectancy (PE) is similar to the concept of “perceived usefulness” in TAM. PE is defined as the degree to which an individual believes that using the system will gain benefits or enhance job performance [14]. PE may have influence on the behavioral intention of students on using e-Schoolbag systems.

Effort Expectancy (EE) is conceptually similar to other existing technology adoption models such as “perceived ease of use” in TAM. EE is defined as the degree of ease to which an individual believes in the association with the use of the system [14]. Students may use e-Schoolbag systems if they find the systems easy to use.

H1: Performance expectancy influences behavioral intention for students to adopt e-Schoolbag systems.
H2: Effort expectancy influences behavioral intention for students to adopt e-Schoolbag systems.

When a person perceives that important referents think he should use the system, this person incorporates the referent's beliefs into his own belief system: since a large number of people cannot be wrong in their opinion, the system must be useful in its purpose [19]. Social Influence (SI) is equivalent to "subjective norm" in TRA and TAM2. SI is defined as the degree to which an individual perceives that important others believe the person should use the new technology [14]. Students may use e-Schoolbag systems in case their classmates are using the systems.

Facilitating Conditions (FC) are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system [14]. FC mean that students have the resources and knowledge necessary to use the e-Schoolbag systems. If schools do not sufficient resources, students may not continue their usage of the e-Schoolbag systems.

H3: Social influence influences behavioral intention for students to adopt e-Schoolbag systems.
H4: Facilitating conditions influence behavioral intention for students to adopt e-Schoolbag systems.

Government should have educational policy concerning IT. Through government subsidies, new technologies can be intergraded into the schools at a rapid rate [27]. Fishbein and Ajzen [17] classified Political Influence (PI) as an external variable that influences user acceptance of a new technology. Therefore, government educational policy may lead to the use of the e-Schoolbag systems.

H5: Political influence influences behavioral intention for students to adopt e-Schoolbag systems.

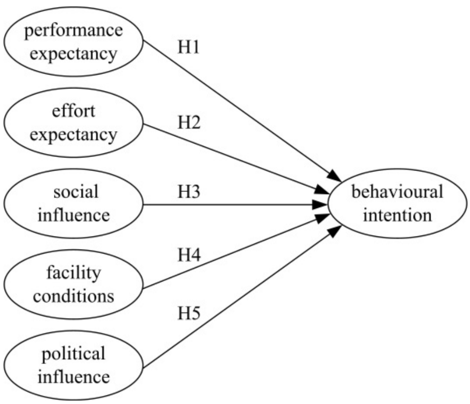

Fig. 1. Research model

3.2 Data Collection

The questionnaire is divided into two sections, including the questions for six constructs and the questions for respondent profile. In section 1, respondents are asked to rate the questions related to a total of 21 measure items of the model along a 7-point Likert-type scale, with 1 set as ‘strongly disagree’ and 7 set as ‘strongly agree’. The measurable items of the latent variables in the model are based on previously published studies. Therefore, the items used to measure PE, EE, SI, FC, and BI are adapted from Venkatesh et al.’s [14] study. The items for the PI are adapted from Lai et al.’s [33] study. The measurable items of the model are listed in Table 2.

In June 2010, Shanghai Municipal Education Commission announced its e-Schoolbag project. 18 schools from pre-school to high school are part of the trial program in Hongkou District. Shanghai took the leading role in the introduction to e-Schoolbag systems in China. Along with Shanghai, Chengdu in Sichuan Province, Ningbo in Zhejiang Province and Zhangjiakou in Hebei Province have also kicked off e-Schoolbag projects in November 2011 [34]. Students from 21 public elementary and high schools in Nanjing, Jiangsu Province, have been given iPads as part of the e-schoolbag pilot project in September 2012 [35]. Therefore, Shanghai as a pioneer city for the adoption of e-Schoolbag systems is a suitable place to study the student acceptance of e-Schoolbag systems. Questionnaire survey was conducted at Hongkou District in Shanghai from November to December 2011. Total 333 sets of questionnaire were collected. However, 33 questionnaires were eliminated (e.g., for giving the same rating for most items), leaving 300 questionnaires as valid for analysis. . The summary of respondent characteristics is shown in Table 1.

Table 1. Respondent Characteristics

		Frequency	Percentage
Gender	Male	136	45.3
	Female	164	54.7
Age	Under 18	69	23.0
	18-23	63	21.0
	24-29	124	41.3
	30-35	29	9.7
	Over 35	15	5.0
Education	High school	73	24.3
	Institute (Diploma)	55	18.3
	University (Bachelor)	145	48.3
	Postgraduate	27	9.1

4 Findings

4.1 Validity and Reliability

The data analysis was conducted using by using SmartPLS 2.0 M3. PLS is a variance based latent variable structural equations modeling technique, which uses an estimation approach that places minimal demands on sample size and residual distributions [36]. First, the measurement model is assessed, in which construct validity and reliability of the measures are assessed.

The confirmatory factor analysis (CFA) is performed to verify the validity and reliability of the measures. Table 2 shows the means, standard deviations, and PLS loadings. All factor loadings are deemed to be significant and to exceed the recommended level of 0.07.

Table 2. Means, Standard Deviations, and PLS Loadings

	Measurable Item	Mean	Std. Dev.	PLS Loading
PE1	I would find the e-Schoolbag systems useful in my study.	4.873	1.228	0.842
PE2	Using the e-Schoolbag systems enables me to learn more quickly.	4.847	1.206	0.883
PE3	Using the e-Schoolbag systems increases my learning ability.	4.887	1.259	0.855
PE4	Using the e-Schoolbag promotes efficient utilization in my study.	4.980	1.227	0.828
EE1	Learning to operate the e-Schoolbag systems is easy to me.	4.840	1.324	0.832
EE2	It would be easy for me to become skillful at using the e-Schoolbag systems.	4.630	1.254	0.839
EE3	I would find the e-Schoolbag systems easy to use.	4.673	1.293	0.799
EE4	It should not be any difficulties to use the e-Schoolbag systems.	4.097	1.216	0.741
SI1	My classmates and friends think that I should use the e-Schoolbag systems.	4.703	1.230	0.851
SI2	Our classmates and friends influence our behavior that we should use the e-Schoolbag systems.	4.763	1.311	0.731
SI3	In general, our classmates and friends have supported the use of the e-Schoolbag systems.	4.670	1.265	0.858
FC1	My school has the resources necessary to use the e-Schoolbag systems.	4.693	1.235	0.720
FC2	My school has the knowledge necessary to use the e-Schoolbag systems.	4.217	1.181	0.788
FC3	My teachers have the skills to use the e-Schoolbag systems.	4.293	1.154	0.753
FC4	Expert is available for assistance with the e-Schoolbag systems difficulties.	4.377	1.205	0.739
PI1	Government educational policy encourages my school to use the e-Schoolbag systems.	4.363	1.173	0.828
PI2	Government has provided enough guidance for my school to comply with.	3.677	0.984	0.648
PI3	Government educational policy induces my school to use the e-Schoolbag systems.	4.733	1.180	0.802
BI1	I intend to use the e-Schoolbag systems in the future.	4.573	1.494	0.909
BI2	I predict I will use the e-Schoolbag systems in the future.	4.257	1.469	0.926
BI3	I have the plan to use the e-Schoolbag systems in the future.	4.367	1.234	0.956

The local fit indices Composite Reliability (CR) and Average Variance Extracted (AVE) are examined as well. Table 3 shows means, standard deviations, Cronbach's alpha measures, CR values, AVE values, and all correlations among variables. It is clear that all correlations are statistically significant. The lowest AVE value of 56.30% is above the recommended standard of 50% and the CR values all exceed 0.8. These results fulfill Hair et al.'s [37] guidelines. The square-root of the construct's AVE exceeds its correlations with other constructs in the model. It shows a necessary aspect of the discriminant validity of the latent constructs [38].

Table 3. Reliability, Validity, and Corrections of the Constructs

	Mean	Std. Dev.	Cronbach's Alpha	CR	AVE	EE	SI	FC	PI	BI
PE	4.897	1.230	0.874	0.914	0.726	0.539	0.499	0.444	0.332	0.450
EE	4.560	1.272	0.817	0.879	0.646		0.485	0.539	0.339	0.600
SI	4.712	1.269	0.751	0.856	0.665			0.647	0.400	0.488
FC	4.395	1.194	0.741	0.837	0.563				0.483	0.524
PI	4.258	1.112	0.645	0.806	0.583					0.445
BI	4.399	1.399	0.923	0.951	0.866					

4.2 Testing of Hypotheses

As recommended by Hair et al. [37], bootstrapping is performed using 300 cases and 5000 samples to assess the path coefficients' significance. The quality of a PLS model can be determined by examining the R^2 values of the endogenous constructs [39]. The model explains 47.73% of variance in behavior intention. Fig. 2 shows a graphical representation of the outcomes of the model test. The results of model test indicate that all hypotheses are valid.

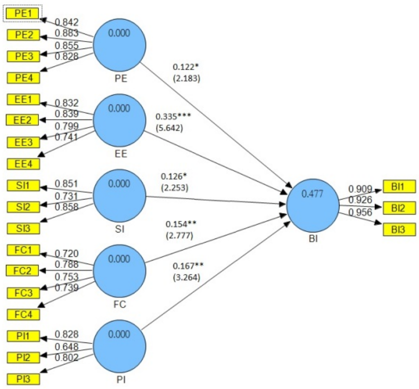

Fig. 2. Results of PLS analysis

5 Discussion and Conclusion

This study proposes and verifies that UTAUT can be employed to explain and predict the student acceptance of e-Schoolbag systems. The results of study indicate that PE, EE, SI, PC, and PI are all significant determinants of BI for students to adopt the e-Schoolbag systems. PLS analysis shows that EE has the highest path coefficient (β=0.335). Thus, EE plays a majority role in the adoption of e-Schoolbag systems. Respondents concerned about the e-Schoolbag systems are easy to use. Students need a simple way to use the e-Schoolbag systems. PI followed by EE is an important factor influencing BI towards adopting the e-Schoolbag systems (β=0.167). Government plays a decisive role in promoting the e-Schoolbag systems. Through the strong government (financial) support, the implementation of e-Schoolbag systems can be speeded up. Additionally, FC and SI also affect student acceptance of the e-Schoolbag systems (β=0.154, β=0.126 respectively). Schools should have sufficient resources and support for students adopting e-Schoolbag systems for ubiquitous learning. These resources and support are not limited to technical, since e-Schoolbag systems create interactive platform for teachers communicate with students, extra teaching resources should be allocated for the e-Schoolbag projects. Of course, classmates and friends' opinions will affect students' adoption of e-Schoolbag systems. Finally, PE also has significant effect on student adoption of the e-Schoolbag systems (β=0.122). Students expect the adoption of the e-Schoolbag systems should improve their study productivity since they can ask questions through the e-Schoolbag systems and obtain their feedback from teachers and classmates. The adoption of e-Schoolbag systems creates a ubiquitous learning environment that helps students to learn effectively.

The introduction to e-Schoolbag systems affects students' learning way. Mobile learning becomes the future trend of education. The development of e-Schoolbag systems still faces several problems such as high implementation costs. The development of e-Schoolbag systems will not happen overnight. With the continued improvement of internet technology, the e-Schoolbag systems will gradually be mature and rapidly spread. There is a day the e-Schoolbag systems would eventually spread to in every concern of the world.

Like in every study, there are a number of limitations attached to this research. The first limitation relates to the size of this study's sample (n = 300). Nevertheless, future research in this area should strive for larger sample sizes in order to perform moderator analyses. Another limitation is the fact that this study was conducted in Shanghai. The findings cannot be generalized to other settings without additional research. Future research should be considered to investigate any cultural differences in other countries.

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How Hybrid Is Referred, Inferred and Preferred?

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Abstract. Conventional definition of hybrid learning has been criticised as sketchy and confusing. This paper critically reviews the literature on hybrid learning and attempts to offer an overview of the state of art in the understanding of the notion of hybrid learning through a meta-analysis of relevant studies. What hybrid learning refers to will be analysed by examining its denotative and connotative senses. Through investigation of the components of the notion, the core and associated elements in the meaning of hybrid learning will be analyzed. Since several terms have been used as synonyms of hybrid learning, their currency and suitability will also be examined.

Keywords: Hybrid Learning, Blended Learning, Hybrid Pedagogy, Mixed-Mode Instruction.

1 Introduction

Increasing attention is being paid to hybrid learning at all levels of education and training. In higher education in particular, hybrid modes of learning has become a growing practice and is gaining widespread acceptance all over the world [1]. It has emerged in response to the increasing need and demand to respond to diverse students' needs, to provide engaging and meaningful learning experiences, and to optimize increasingly scarce resources for higher education [2].

Though the high currency term, hybrid learning, enjoys wide usage, what it refers to or is assumed to be could be misleading and confusing. As Oliver and Trigwell argue, 'hybrid learning' is ill-defined in a number of ways [3]. The possibilities of what and how to hybridize modes of learning are virtually limitless [4]. Considerable number of combinations of media, instructional designs, and teaching strategies could be embedded in the notion [5]. The broad range of assumptions and foci embedded in the use of terms blurs what one could infer. This warrants proper examination of the term and investigation of what are preferred trends in the usage of the term.

Terminology adds to the perplexity of the notion – hybrid learning, and a variety of terms used as synonyms. The term is often used interchangeably with 'blended learning' or 'mixed-mode learning', and is closely associated with flexible or distributed learning [6]. It is also known as 'hybrid instruction' or 'blended instruction' [7]. To minimize confusion, it is necessary to put this set of related terms in perspective.

This paper critically reviews what hybrid learning means and what is associated with its meaning. It attempts to offer an overview of a meta-analysis of relevant

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 345–355, 2013.

studies. In the following, what the notion of hybrid learning refers to will first be analysed by examining what the term denotes and connotes. The denotative semantic compo-nents distillate from the analysis signifies core meaning of the term and the connota-tive senses perceived from the analysis uncovers patterns of how the terms have been utilised. Through investigation of the components in and associated with the notion, this study then expounds and summarizes what the spectrum of ideas are suggested by the term. To clearly describe what hybrid learning means, the terminology commonly employed for the notion will be examined. The usage of terms commonly regarded as synonyms such as 'blended learning' and 'hybrid instruction' will also be analysed.

2 Denotative Senses

'Hybrid learning' (or 'blended learning') has generally been taken as an integration of traditional face-to-face and some form of e-learning [8, 9]. Colis and Moonen hold that it refers to the instruction taking place both in the classroom and online and that the online component continues naturally from traditional classroom learning [10].

This typical approach to interpreting the term seems prevalent. As Dziuban, Moskal and Hartman note, blended learning consists of at least two modes used in the same course as it can be related to the combination of web and face-to-face interactions that are necessary to present a course utilizing the best of both instructional worlds [11]. At its simplest, as Garrison and Kanuka put it, blended learning is the "thoughtful integration of classroom face-to-face learning experiences with online learning experiences" and, that through the Internet, it provides large numbers of learners with interactive learning experience in an accessible and cost-effective way [12]. Dowling, Godfrey and Gyle considers blended learning a teaching model allowing flexibility by delivering learning contents electronically while keeping regular face-to-face classes [13]. Harding, Kaczynski and Wood also mark blended learning as "a mixture of online and face-to-face learning using a variety of learning resources and communications options available to students and lecturers" [14]. Similarly, Mitchell and Honore define blended instruction as "learning involving multiple methods and approaches, commonly a mixture of classroom and e-learning" [15].

The prevalence of this interpretation seems easily understandable because an over-whelming majority of institutions (or organisations) have been using face-to-face interaction as their major means for delivering education or training. The introduc-tion of the online mode is a rather recent phenomenon. With the advent of infor-mation and communication technology, new means have become available for adop-tion in the teaching/learning process. Thus to educators who have been providing education or training by face-to-face delivery, it is natural that some online compo-nents have become an integral part of the course.

This could be regarded as a narrow sense of hybrid learning. In a broad sense, the blend frees the blender from any restriction to face-to-face and online learning, and allows the mix of other educational modes as well. In the narrow sense, mixing only face-to-face and online learning has led to limitless number of possible integrations [12]. The possibilities substantially multiply in the broad sense.

One or more online activities could be adopted in the same course [16]. Yet, a word of caution is necessary. A course integrating in it various online activities is rarely called a hybrid course. Similarly, a course integrating various classroom activities are rarely considered a hybrid. A hybrid mixes in it modes of learning rather than activities of one single mode. In addition, while acknowledging that terms related to online learning (such as e-learning and technology enhanced learning) could differ substantially from it, this paper uses online learning in a generic sense for simplicity.

Although there are a plethora of definitions or interpretations, in essence, the term 'hybrid learning' can be boiled down to the following components as the core part of its meaning or its denotative sense:

- An integration of teaching/learning modes in the same unit of study (which could be a study programme, a course, or a module);
- Including at least two teaching/learning modes (while the actual number of modes can be as many as the study unit can or should accommodate); and

If in the narrow sense,

- Having online learning as one mode integrated into the conventional face-to-face mode; or

If in the broad sense,

- Having any two learning modes integrated.

The dichotomy of narrow and broad senses helps perceive the conceptualisation of the hybrid, but it may give a reductionist view of reality. Though there does not seem to have been any reliable statistics, the majority of hybrid learning appears close to the narrow sense, and even when the broad sense is used, there have rarely been cases that none of the modes in the blend is online learning. The convention tends to take online learning as one necessary component for the mix.

The usage of the term focuses on teaching rather than learning and the blend is often considered to be in pedagogy rather than the learner's construction of knowledge (Delialioğlu, 2012). Oliver and Trigwell argue that 'learning, from the perspective of the learner, is rarely, if ever, the subject of blended learning', and propose that the term be 'blended pedagogies', 'blended teaching' or 'learning with blended pedagogies' [3]. Though views like these do not seem to have any significant effects in the use of terminology, such views are worth attention for anyone seeking to identify what the term denotes. In essence, meanings of hybrid learning can be distilled into simple core denotative sense of the term as Table 1.

Table 1. Denotative Sense of Hybrid Learning

Narrow sense	**Borad sense**
Integration of two or more pedagogic modes in which one is online and the other is conventional.	Integration of two or more pedagogic modes which could be of any kinds.

3 Connotative Senses

Hybrid learning carries a load of implicit meanings embedded in its use. While there are many possibilities of mixing pedagogical modes, the actual implementation depends on focus of the contexts. The meaning of hybrid learning is closely associated with the value behind the motivation of adopting it. The focus of the adoption varies from one context to another.

Many focus on tapping the benefits of pedagogical modes used. Singh and Reed see that blended instruction serves to optimize learning outcomes through an instructional delivery method which adopts more than one delivery mode [18]. With this pedagogical orientation, Delialioglu and Yildirim suggest that blended instruction refers to the mix of classroom instruction and online instruction with which benefits of both instructional modes could be achieved [19]. Along the same line of thought, Rovai and Jordan consider hybrid learning as "a flexible approach to course design that supports the blending of different times and places for learning, offering some of the conveniences of fully online courses without the complete loss of face-to-face contact" [20]. Finn and Bucceri see that a blended learning environment capitalises on the advantageous aspects of both the online learning method and the traditional method (such as face-to-face interaction) by integrating traditional physical classes with elements of virtual education [21]. In Lim and Morris' study, hybrid learning is considered to be an appropriate mix and use of face-to-face instructional methods and various learning technologies to support planned learning and foster subsequent learning outcomes [22].

In contexts where the focus is on media and tools employed in learning, the emphasis is laid on the use of technology. Hybrid learning fundamentally include the use of online communication tools, for instance, the Internet, collaborative software, classroom management software as well as e-tutoring or e-mentoring [23]. Taking hybrid learning as a blend of delivery media, Singh see that the distinctive advantage is that the media complement each other for promoting learning, and he see that hybrid learning programmes could include a variety learning tools, like self-paced Web-based courses, real-time collaboration software, electronic performance support systems (EPSS) embedded within the job-task environment, and knowledge management systems [24]. Valiathan also describes blended instruction as a combination of different instructional systems, such as collaboration software, web-based courses, EPSS, and knowledge management practices, as well as various event-based activities [25]. These studies lay emphasis on the utilization of technology as a tool for enhancement of learning quality.

The focus could be on meeting students' specific needs, and freeing the teach-ing/learning from the restrictions of a single instructional mode. Akkoyunlu and Yil-maz-Soylu point out that factors, such as learners' individual differences, personal characteristics, their opinions and learning styles, have significant impacts on a learning environment [26], and Ostguthorpe and Graham also take the characteristics of students, together with instructional objectives, as an important factor to consider when integrating online learning into a conventional course [27]. The emphasis thus is on the match between learners' characteristics and instructional design, which for example, stresses establishing a balance between the online and other parts of the course, such as how often teachers and students should meet each other and what interactive environment they should be in, rather than how to present the course.

This focus often entails that a hybrid allow learners more choices to take charge of their learning. Yet to benefit from the choices and the opportunity and to take charge, it is necessary that students possess the ability to choose and wish to do, so or the effects can be detrimental [28, 29]. Not only are there implications for students' role, but also for teachers' [30]. Different delivery modes of education somehow require the teacher and the institution to perform some dissimilar roles.

No matter what the focus is, practices or studies share a common aim – learning effectiveness. Making learning effective is taken as a shared value. With this as the priority, Singh and Reed "propose to refine the definition to say that blended learning focuses on optimizing achievement of learning objectives by applying the 'right' personal learning technologies to match the 'right' personal learning style to transfer the 'right' skills to the 'right' person at the 'right' time" [18]. As Hoic-Bozic, Mornar and Boticki note, the aim of hybrid learning is "to choose a mixture that will highly motivate the students, and assist them in successfully mastering the course." [31]

In summary, hybrid learning is closely associated with the following expectations:

- Fundamental:
  - learning effectiveness – to maximize learning success
- Common emphases (not mutually exclusive):
  - Tapping the benefits from different pedagogical modes
  - Utilizing proper technology – to deliver instruction through suitable media and tools
  - Meeting students' needs
  - Addressing learner characteristics – to meet learners' specific needs

The connotative gist is not necessary in understanding the meaning of the term; yet it offers insights and guidelines on how the term has been used and what associative meanings are conveyed with it. The connotative sense of hybrid learning can be summarised as Table 2.

Table 2. Connotative Sense of Hybrid Learning

Focus	**Target**	**Goal**
Aim	Learning effectiveness	Achievement of learning outcomes
Technology	Choice of media/tools	Maximizing benefits from available technology
Student	Needs	Effective satisfaction of needs
Role	Students/teachers/institutions/ organisation	Performing properly for facilitating learning

4 Hybridized Components

As noted above, there is a very broad range of possibilities of what to be put into the blend. The components to be hybridized could be highly diverse. They could also be categorized in various ways. For example, they could include synchronous means like face-to-face meeting and chat, asynchronous means such as online discussions and e-mail, as well as assessments in online or on-site forms [20]. Delialioglu and Yildirim discuss five elements in blended learning, namely delivery of material (such as website and online materials), interaction with materials (such as multimedia, web browsing, cognitive web tools, homework, quizzes and classroom activities); interaction with teacher (such as web announcements, forum, phone, face to face questions and consultation), interaction with students (such as web forum, email, group work, classroom discussions and project), and intra-action (such as classroom discussions, group work and web forum) [32].

The components being hybridised could be pedagogical approaches. Wenger and Ferguson, in a task-oriented manner, explain a hybrid learning model with four components, which are teaching (online content delivery to learners), coaching (instructor-guided learning in both online and offline environments), studying (learners' efforts to achieve desired learning goals using resources such as online self-study tools), and practicing (authentic learning through hands-on experience using simulations or virtual learning activities) [33]. In a similar manner, Rossett, Douglis and Frazee point out that blending involves a planned combination of approaches, with examples like coaching by a supervisor, participation in an online class, breakfast with colleagues, competency descriptions, reading on the beach, reference to a manual, collegial relationships, and participation in seminars, workshops, and online communities [34]. In his study, Li examines hybrid courses with a broad range of components such as lecture video with synchronized powerpoints files, self-study distance learning material, online discussions, online quizzes, oral presentations, project work, action research projects, online discussions, and talks by guest speakers [4].

There have been attempts to categorize the hybridized components. For example, Rossett, Douglis and Frazee organise the possible hybridized components into groups, according to whether they involve formal or informal/personal interaction and whether the instruction is online, offline or the provision of tools. Table 3 proposes a set of categories of such components [34].

5 Proper Choice of Terminology

As a variety of terms have been used for 'hybrid learning', it is useful to examine which of them are more appropriate ones. The analyses above suggest that 'hybrid learning', 'blended learning', and 'mixed learning' and more precisely 'mixed-mode learning' could reflect what they are supposed to denote and connote. We also consider 'hybrid instruction/pedagogy', 'blended instruction/pedagogy', 'mixed-mode instruction/pedagogy' and 'mixed instruction/pedagogy'. To decide which of the terms should be used, one other important aspect to consider is their currency.

Table 3. Possible Hybridized Components

	More formal/organized	Less formal/organized
Online	Online-course material (textual and multimedia) Web-based quizzes, exercises, and tests Live e-learning classes E-mentoring Simulation practices	Emails Online discussion board Group messages on social media Practices using online environments
Offline	Face-to-face lectures Face-to-face tutorials Workshops Talks by guest speakers Coaching/mentoring Visits	Collegial connections Informal gatherings Group projects Study groups

Offering a general picture of currency of these terms, Table 4 lists the number of results of the terms in the search engines of 'Google' [35] and 'Google Scholar' [36].

As reflected in the number of search results, the currency of these terms varies considerably. The numbers from Google Scholar suggest that 'hybrid learning' and 'blended learning' have been well accepted as standard terms while 'mixed-mode learning' and 'mixed learning' tend not to be so recognized or used as a convention. Among the terms, 'blended learning' is most popular both in general and in academic literature.

The use of hybrid or blended learning rather than hybrid or blended instruction has been the trend. As reflected in low figures in Table 5, compared with results of similar terms in Table 4, it is evident that educators, scholars and researchers are inclined to using learning, though pedagogy or instruction rather than learning is predominantly the theme of literature on hybrid learning.

Table 4. Search Result Numbers of Hybrid Learning Related Terms

	Term	Number of search results*
Google	"hybrid learning"	347,000
	"blended learning"	2,440,000
	"mixed-mode learning"	145,000
	"mixed learning	15,200
Google Scholar	"hybrid learning"	13,600
	"blended learning"	40,600
	"mixed-mode learning"	225
	"mixed learning	1,300

* Figures taken from searches done in Hong Kong on 14 May 2013.

Table 5. Search Result Numbers of Hybrid Instruction Related Terms

	Term	Number of search results*
Google	"hybrid instruction"	15,300
	"blended instruction"	24,900
	"hybrid pedagogy"#	49,500
	"blended pedagogy"	3,200
	"mixed-mode instruction"	24,800
	"mixed-mode pedagogy"	27
Google Scholar	"hybrid instruction"	833
	"blended instruction"	1,040
	"hybrid pedagogy"#	115
	"blended pedagogy"	154
	"mixed-mode instruction"	73
	"mixed-mode pedagogy"	4

* Figures taken from searches done in Hong Kong on 14 May 2013.
# One major reason for the high number for 'hybrid pedagogy' is the new digital journal, Hybrid Pedagogy, and its 'MOOC MOOC', an experimental online course.

[Note : The figures for 'mixed instruction' (Google: 15,400; Google Scholar: 328) and 'mixed pedagogy' (Google: 960; Google Scholar: 68) are not included in the table because the search results include a substantial portion of irrelevant items, such as mixed pedagogy from difference countries.]

6 Conclusion

Recent trends of hybrid learning capitalise on information and communication tech-nology. There are signs that it is growing mature and getting better defined. The meta-analysis of this paper has highlighted that the denotative senses of hybrid meaning is rather limited. It refers basically to a learning mode integrating two or more learning modes, and there are narrow and broad senses of the term. The narrow sense restricted to a blend of online and conventional face-to-face learning, which opens up limitless pedagogical possibilities and opportunities. The broad sense allows combination of any modes and immensely extends the prospects. The core connotative sense identified points to learning effectiveness that the hybridization should aim at. The use of hybrid learning underlines proper use of available technology and adoption of appropriate pedagogy for satisfying student needs and the necessary role changes of stakeholders in the learning, especially the student and teacher. What is hybridized could include a broad spectrum of teaching/learning activities that could be classified as groups online and offline, as well as groups of more formal and less formal ones.

With their high currency of use, both 'hybrid learning' and 'blended learning' are well accepted terms. It does not seem necessary to pedantically insist on using 'hy-brid instruction' or 'hybrid instruction' when teaching is actually referred. The use of 'learning' in fact helps remind educators that the teaching is for learning. It has also been noted that ‘hybrid learning’ has a substantially lower frequency of use than ‘blended learning’. There does not seem to be any reason to give up this term. On the other hand, ‘hybrid learning’ signifies valuable meanings. Besides its literal sense of integrating two of more areas together, ‘hybrid’ entails that the integration is inherent. This sense highlights that the mix is not for the sake of combining or simply having varieties, but to bring to learning inherently a new kind of life.

Given the highly diverse sense of the term ‘hybrid learning’ and the fast development of the possible hybridization, with the advancement of technology, some periodical critical review of the term seems desirable.

Acknowledgement. Supported by the Open University of Hong Kong Research Grant (No. 2012/1.2).

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Blended Learning: The View Is Different from Student, Teacher, or Institution Perspective

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Abstract. There have been many attempts to define blended learning or hybrid learning. The purpose of this article is to present the views of the authors on defining the concepts of blended learning based on the perspectives of instructors, students, and administrators. Depending on the perspective model used, there can be implications on budgetary and support issues to institutions. Developing successful blended learning programs requires a sound institutional strategic plan. Best practices will be presented as reference for instructors to plan and implement a successful blended learning program.

Keywords: Blended Learning, Hybrid Learning, Online Learning, eLearning, Instructional Design.

1 Introduction

Online learning has been gaining popularity in recent years since computer and Internet technology has grown tremendously in terms of speed and affordability. This makes learning convenient and accessible as well as self-paced and personalized instructions.[1] Online learning usually means no face-to-face in-class meetings within a physical environment and learners will have the complete learning experience on a computer or mobile device. Nevertheless, there are limitations in online learning. Students may find it difficult to navigate within the course site either due to their computer literacy level or the design itself. [2][3].

However, many institutions have incorporated online learning to complement in-class meetings. Usually the online portion will provide learners with supplementary materials or collaborative discussion forums. This has coined the new terms: blended learning and hybrid learning. There are numbers of research studies covering this mixed learning mode and described how instructors have adopted this type of learning approach. [4][5][6] With the combined modes, learners can have the best of both worlds in their learning experience. Course material and class discussions can be accessed at any time. Research has shown that students favoured this type of delivery mode. [1] On the other hand, some institutions decided to move towards a blended learning space because of the increasing growth of student enrollment and limited numbers of classrooms available on campus as well as budgetary restraints to hire

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more in-class instructors. Some studies suggested that offering an online option would encourage students' participations and in-class attendance. [7][8]

Teaching a class in a blended mode is not an easy matter. The instructor must be capable of delivering the in-class portion of the course, for example, conduct an inspiring lecture, while managing the online portion of the course. The expectation from the students increases as they can now be in touch with the instructor 24x7 instead of the traditional classroom mode where students will meet the instructor at a pre-scheduled in-class time or office hours. Moreover, the instructors also have to be flexible by adopting new tools and technologies in order deliver online materials. [9] From a students' perspective, one has to learn how to manage their time as they have to progress through the online course material using "self-study". Students tend to be easily side-tracked by browsing other sites or by their social network sites while they are taking the course "on-line." Online learners need to be independent learners, and, most importantly, feel comfortable with technology. [10] One should not be discouraged by these potential challenges in implementing a blended mode of learning. Having a carefully managed strategic plan in place can ensure the success of the program and acceptance from the instructors and students.

In this paper, the authors will investigate the definitions of such combined modes of learning and the best practices in offering such learning space successfully.

2 Definitions of Blended Learning

There are many attempts to define blended learning or hybrid learning. Depending on an individual's perception of this type of learning mode, one will get a variety of definitions. [11] Mason suggested that the term had been so overused that it lost its meaning. [12] The fundamental concept of "blended" implies "greater flexibility, responsibility, and control that students have with regard to their learning activities;" [13] and collaborative in the learning process. Blended learning offers an integration of in-class and online interactions between instructors and students.

Graham saw four possible levels where the blended learning concept can be applied: [14]

1. activity level, where a single classroom meeting could be preceded or following by online study;
2. course level, where online lessons alternate with face-to-face classroom meetings;
3. program level, where totally online courses co-exist with totally face-to-face courses; and
4. institutional level, where both totally online programs and face-to-face programs are offered.

This provides a much broader definition on blended learning than any others but there is minimal fundamental difference.

Another attempt to define blended learning is based on its proportion of online and in-class instructions. Allen, et. al. conducted a survey, funded by the Sloan Consortium, Eduventures and Babson Survey Research Group, defined blended courses as "having between 30 percent and 79 percent of the course content delivered online" and "'Face-to-face' instruction includes those courses in which zero to 29 percent of the content is delivered online; this category includes both traditional and web facilitated courses. The remaining alternative, online courses, are defined as having at least 80 percent of the course content delivered online." [15] The term "hybrid" was implied in the definition of "blended" in this survey report that made no distinction between these two terms.

A different definition of blended learning is that the learners would have a choice between attending an in-class on location and participating online through a synchronous connection. [16]

To help better define the online portion of the blended learning, the following is the selected list of tools and applications for online delivery: webcasting, audio/video lecture streaming, podcasts, mobile device compatible, wikis, blogs, journals, e-books, interactive gaming, digital libraries and other online resources. This is by no means a comprehensive list as the list is expected to change or grow upon the latest technology development.

In this paper, the authors' position is that blended learning is the same as hybrid learning. The definitions of these two terms are the same and the terms may be used interchangeably in the paper.

3 Models of Blended Learning – Three Perspectives

The commonly accepted definition of blended learning places it in a continuum with conventional face-to-face classroom courses on one side and fully online e-learning on the other side [17]. While it is easy to place markers at the 30 percent and 80 percent markers within the continuum, these are relatively arbitrary clip levels and focused entirely on delivery instead of educational pedagogy.

It is important to have a clear understanding of blended or hybrid learning as it is the primary source of confusion in the expectations of the student, teacher, and administration. When a course is offered in the calendar as hybrid, students do not automatically think "that means between 30 percent and 79 percent of the course is online". Instructors, particularly those whose predominant experience is teaching in the classroom, are often surprised to find that they are expected to be "available" seven days per week as opposed to showing up at the same designated time each week. Finally, schools may charge students different fees for online versus classroom courses and may pay instructors on different pay scales as well. Does the introduction of hybrid learning mean a third pricing and financial structure?

The authors will present a model of blended learning with viewpoints from the student, instructor and administration perspectives. It will be argued that a definition based purely on delivery is oversimplified and inadequate.

3.1 Student Perspective

When students enroll in a hybrid course, they are often looking for the best of both worlds. They enjoy the convenience of being online and learning at their own convenience along with the option of interacting with their teachers and classmates,

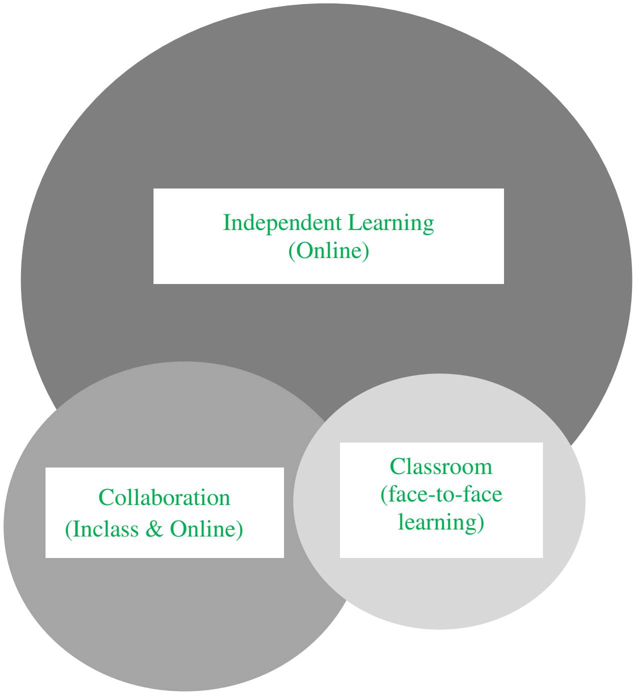

Fig. 1. Independent Learning, Classroom and Collaboration Model

but on their own terms. Figure 1 is a graphical representation of the student expectations for blended learning. The size of the circles is approximately representative of the amount of activity they are willing to devote to learning.

The majority of the course can be completed in independent learning. This is the classical online model where the lectures, assignment, homework and evaluation can be done in an asynchronous manner. In a hybrid course, the collaboration component occurs naturally if left on its own as students are familiar with reaching out to classmates. However, instructors who are keen on seeing interaction may sometimes assign participation marks to the discussion board or other online collaborative tools. The attempt to measure collaboration often has the unintended effect of forcing contrived discussion as students comply with their obligatory postings.

From the student perspective, the face-to-face classroom component is preferred to be optional. It is nice fall back plan in case the student is having difficulty comprehending the subject material with the online lessons. Having the opportunity to meet with the instructor and other classmates is appreciated, but students prefer to come in on their own terms. As with online collaboration, instructors often try to force the students to come in for face-to-face learning by assigning marks to these sessions.

3.2 Teacher Perspective

Instructors are naturally familiar with lesson plans, curriculum, classroom activities and following a syllabus. The commonly held view is that online is simply an alternate delivery channel for some of these classroom activities. The sum total of activities throughout the course remains the same; the benefit of hybrid learning is that classroom time can be reduced by transferring some portion of the classroom workload to online.

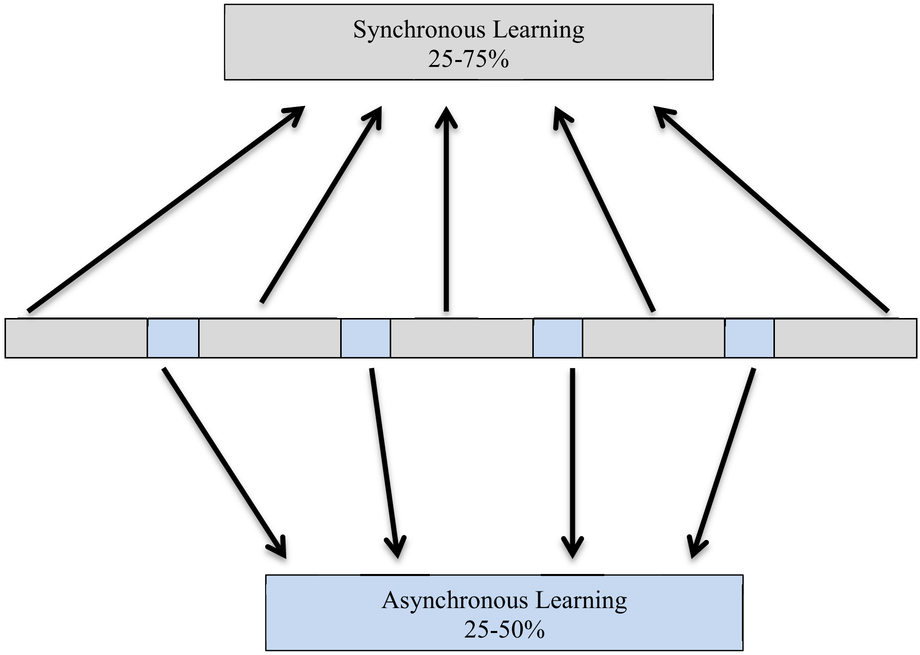

Fig. 2. Synchronous Learning & Asynchronous Learning

The teachers' conceptual model of hybrid learning is represented in Figure 2. Classes are often run with the same syllabus and timeline as the equivalent face-to-face classroom course. Students are expected to be in the classroom, learning synchronously, as a class cohort. There are modules where the students are expected to study independently and asynchronously. However, the overall educational pedagogy for a hybrid course is fundamentally the same as an in-class course. The benefit of a blended methodology is often the convenience of not having to come into the classroom for a pre-defined period of time, such as the total number of customary required face-to-face meetings in a semester or quarter. This is a delivery focus, often packaged as a new educational offering.

3.3 School Administration Perspective

Schools have the practical concerns regarding booking of space and finding the right classrooms capable of accommodating the enrolled number of students. Additionally, they must have user logins, course shells and content loaded into their learning management systems. A decision to offer a hybrid or blended course is deliberate and must be planned in advance of the start date.

Figure 3 is a representation of the considerations that must be taken into account from a school administration perspective. In order to run a class, either a physical or digital classroom must be in place, and sometimes both. If an instructor elects to utilize the physical classroom and not the digital classroom, this falls into the category of the traditional in-class format. Similarly, a traditional online course would only require the digital classroom.

The authors propose a subtle, but significant difference in defining blended and hybrid courses. Courses which are designed and delivered around a mandatory classroom component typically use the online capability of wikis, blogs, webinars to supplement the classroom learning. In these cases, the term blended shall be applied to the course. There will not be a need to further define percentages of time dedicated to classroom or online delivery.

The authors use hybrid to define an educational pedagogy where the key focus is on the digital classroom and optionally on the physical classroom. The synchronous learning components of the course are still important, and but from a student perspective, they have the option of participating face-to-face or through the use of webinars and other educational broadcast and replay technologies.

By describing a course as a hybrid offering using this definition, prospective students who may be located in different countries or busy professionals with unpredictable schedules can still enroll. The requirement to attend face-to-face is at their option and not dictated by the instructor.

Digital Classroom

Physical Classroom

	Mandatory	Optional	Not needed
Mandatory	Blended	Blended	Traditional inclass
Optional	Hybrid		
Not needed	Traditional online		

Fig. 3. Blended, Hybrid & Online Classrooms

4 Conclusion

There is still no universally accepted definition for hybrid versus blended learning. Similarly, terms like online education, distance learning and e-learning have been used interchangeably in consumer media and educational institutions alike. Each model as described above will have an impact on the budget for resources, e.g. human resources: instructional designers, technical support; system resources: learning management system, licensing costs, maintenance and backup costs, etc. Expectation of the instructors and students must be clearly defined. It is critical for an institution to have a sound strategic plan for blended learning delivery before implementation and as part of the academic curriculum development.

The model presented in this paper does not factor the consideration of cultural difference in defining the terms. Different cultural may have a completely different perception of online. In some countries, in-class is still considered as the recognized mode of instruction. Further research should investigate the cultural perspectives on understanding and defining blended learning.

The fundamental concept of "blend" best described "the greater flexibility, responsibility, and control that students have with regard to their learning activities.[18] No matter which model of blended learning, the main focus of a successful learning environment should be learner-centered to encourage student engagement and collaboration in the learning process. The tech-savvy and e-mobile younger generation and the non-traditional student population now expects more contents via technological media on multi-platform mobile devices and values the convenience factor. Blended learning can meet this growing demand which might be in one day when it becomes a norm. A classroom surrounded by a brick wall is unlikely to disappear but Internet technology has already become a virtual component of this physical classroom.

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MISSED – Studying Students' Development of Misconceptions in Hybrid Courses

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Abstract. We implemented a methodology for studying how learners develop misconceptions during the situated experience of teaching and learning as well as during the situated experience of cognitive and behavioral expression of what has been learned during real-world application. This methodology now has been embedded into software-hardware platforms suitable for use by learning management systems (LMS) and massive open online courses (MOOCs). These types of platforms together constitute an educational environment we call the **MISSED** – **M**isconception **I**nstantiation as **S**tudents **S**tudy **E**ducational **D**omains. **MISSED** can be used to assess learners' conceptual and performance competencies in ways allowing cognitive and behavioral mapping that reveals patterns of misconception development.

Keywords: adaptive learning, evidence-based learning, e-learning, e-teaching, learning assessment, misconception development, knowledge systems.

1 Introduction

We describe the methodology and research foundation that resulted in an inclusive adaptive learning environment we call **MISSED** – **M**isconception **I**nstantiation as **S**tudents **S**tudy in **E**ducational **D**omains. The acronym of **MISSED** acknowledges that inclusive and adaptive environments are emerging concomitantly with dramatically increasing use of digital educational modalities. However, despite very aggressive implementation of hybrid and totally online courses at all levels of education and training, there is still a lack of evidence-based frameworks for educational and training methods, materials, and delivery modalities. Tashiro, Hung, and Vargas Martin [1] described how the lack of evidence-based frameworks for hybrid learning results from the complexity of studying and implementing such frameworks as well as from the absence of coherent theoretical frameworks that might guide systematic studies of the enormous complexity inherent in hybrid learning. During a decade of research, we had identified a critical set of knowledge gaps related to educational environments and their effectiveness. To date, we feel confident that there are at least 10 gaps in knowledge about how educational environments "really work" to change an individual's learning outcomes and willingness as well as ability to

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sustain behaviours related to learning [1]. We decided that if we could identify how misconceptions become instantiated we would also find out a lot about the other nine knowledge gaps:

- what factors shape disposition to engage in learning and engage in behaviors based on what has been learned, with accurate knowledge transfer of knowledge;
- what are the impacts of level of realism on learning when a student works within a learning object or set of objects;
- how can we define essential thresholds for learning and what knowledge domains are being developed;
- how, what, and why do students construct their knowledge during learning;
- what relationships exist between conceptual and performance competencies; and
- how is learning impacted by social networks, formal or informal.

2 Methodology for Building the MISSED Environment

The central goal of our methodology was to create a Space-Time mapping of each individual's conceptual and performance competencies to their decisions during engagement in educational and knowledge transfer activities. Misconceptions identified during assessments of each individual could then be mapped to Space-Time moments in the individual's learning processes. To facilitate such mapping, we started with a previously built simulative environment to improve health sciences students understanding and practice of interprofessional care, Interprofessional Simulations – **IPSims**. **IPSims** was then rebuilt using the more comprehensive **MISSED** architecture to create a research platform we called **MISSED_IPSims.** This rebuild involved layering monitoring middleware into the simulations so that we could record each student's navigational and engagement decisions as well as time spent in various activities. Using monitoring data coupled to learning assessment outcomes within the simulations we could map students' learning and competency outcomes against expectations delineated by expert clinical panels.

We designed **MISSED_IPSims** environments so that complex learning objects, simulations, learning resources, learning activities, learning assessments, educational scaffolding, and assessment diagnostics could be loaded and linked from learning object repositories and relational databases for any subdiscipline of a content-skills domain and for any pattern of usage selected by faculty and/or end-users (i.e., students or trainees). Such modularity also allows a faculty member to select a preferred model of cognition or teaching strategy as a framework for developing algorithms to configure learning activities as well as learning objects and resources into the learning maps for the respective model of cognition or teaching strategy.

A diagrammatic representation of **MISSED_IPSims** is provided in Figure 1, with images that show some of the preliminary studies with Canadian health sciences. This research platform provided a rich environment in which we could study the following sequence of education for nursing students: (1) a student is working in a hybrid course within a nursing curriculum, engaging in a variety of learning activities, including work within a Web-based interface, compatible with any learning management system, and designed as an Inclusive-Adaptive System that assesses their accessibility needs and preferences for a personalized educational environment; (2) the Inclusive-Adaptive Interface collects data on the student's needs and preferences, then creates a Student Profile database that becomes part of an Electronic Learning Record; (3) the Student Profile data stream to a MatchMaker system that selects an Instructional Deign Template (IDT) based on a theory of cognition and behavioral change and consistent with the course content, but informed by the student's needs and preferences; (4) the MatchMaker engine then reads the metadata from the template; (5) the Assembler Engine reads the IDT and metadata brought to it by MatchMaker, searches Learning Object Repositories to find and collate learning activities, resources, educational scaffolding, learning assessments, and feedback personalized for the learner, and then organizes the assemblage to create a Web-based personalized teaching-learning-assessment-diagnostic Educational Environment; (6) students engage within the Educational Environment as well as in face-to-face settings (e.g., skills labs, low-fidelity or high-fidelity simulations); (7) within the Web-based Educational Environments, each student is constantly monitored by middleware called PathFinder that follows choices made within the Educational Environments and times her engagement in learning activities, resources, assessments, and using diagnostic feedback; (8) within the face-to-face environments (e.g., skills lab), a student is monitored during learning-demonstration activities, using a video-capture and analysis system called MAXIT EDUCATION [17] that efficiently collects assessment data on students' performance competencies; (9) prior, simultaneously with, or after learning-demonstration activities, students enter an assessment engine called eXAM[3] [18] which assesses their learning outcomes within a cognitive taxonomy selected by the faculty member (e.g., Bloom's Revised Taxonomy or the domain categories and levels of difficulty found within the NCLEX-RN); (10) PathFinder, MAXIT EDUCATION, and eXAM[3] stream a student's data to a data analysis and knowledge system called DATUMM; (11) DATUMM, in turn, analyzes the data, creates new information about the student, and sends this information back to the Student Profile. These new information sets are integrated into the Student Profile, with revised data and information facilitating adaptive changes to the flow

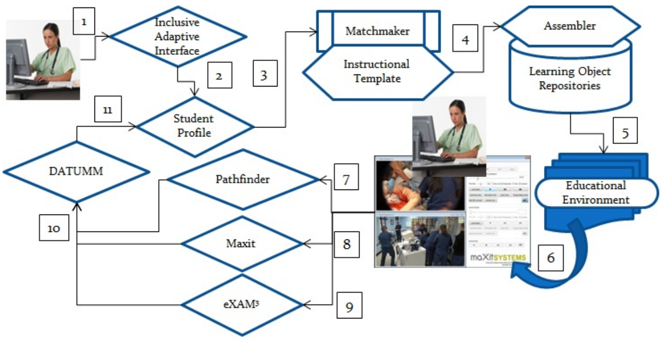


Fig. 1. Diagrammatic Representation of the MISSED Environment in Nursing

beginning with the MatchMaker and ending in new configurations of the Educational Environment. Importantly, data from the Student Profile also stream to the Electronic Learning Record, through time creating a longitudinal record of a student's progress.

As students work through assignments and demonstrate skills, the **MISSED_IP Sims** environment collects data on students' conceptual and performance competencies, creating a very detailed Electronic Learning Record. The ELR also can be constructed to receive data and information from multiple courses, and so create a much more detailed and informative multidimensional student transcript. Preliminary studies of this platform provide evidence that it will complement faculty efforts without increasing workload, while providing new tools and types of data for better assessing students' conceptual and performance competencies. The platform also allows detailed analysis of cognitive processes and behavioral choices that can be used to trace development of misconceptions.

In Figure 2, we show a GUI from the **MISSED_IPSims**. This type of GUI allowed duplication of every pathway that a student might take in an immersive environment. The GUI shown in Figure 2, has three scenarios pathways developed by clinical experts to portray different facets for the care of an elderly man. In Figure 2, you can see three buttons on a top navigational bar Scenario1-Scenario2-Scenario3, which allow a student, instructor, or researcher to quickly shift scenarios. In this case of interprofessional elder care, the GUI shows Scenario1 selected, revealing interprofessional health team interactions in a hospital emergency room after the man fell and injured himself. Scenario2 portrays the elder man's in his home and interactions during a home health visit as a follow-up to hospital discharge. Scenario3 portrays a meeting in the elder man's home involving him, his daughter, and a mental health team. The GUI also shows a top navigational bar for Library, Scopes of Practice, and IP Competencies. These Learning Resources are available within the educational environment for any learning activity related to improving competencies related to elder care in this educational simulation.

Along the left side of the screen in the GUI of Figure 1, you can see another navigational bar. The buttons along this bar provide interactions specific to a particular scenario. So, when the Scenario1 button is clicked on the top navigation bar, data are loaded so that the left-hand navigational bar buttons access data relevant

Fig. 2. Graphic User Interface for Prototype

only to the emergency room visit that was conceived as the immersive environment of Scenario1. Such a prototype and GUI design allow researchers to conduct iterative analyses driven by a Gedanken model of posing "what if" questions. For example, the GUI shown in Figure 2 allows researchers to select pathways that mimic the movement and interactions within a 3-D world. In a simplistic sense, such prototypes are very sophisticated storyboards, but also provide models of data architecture that can be tested in ways that show how such architecture would behave in a 3-D immersive environment. As a specific example, notice in Figure 2 that there is a button on the left-side navigational bar called "Case Encounter." This button accesses a high quality video of a case encounter in which multiple care-givers are attending the elderly patient. Such a video allows us to see how, where, and why to construct the 3-D world in order for a student to sensibly engage in a more detailed and first-person action simulative teaching-learning-assessment environment for a modified version of MISSED_IPSims.

We also note that the GUI in Figure 2 is based on an instructional template consistent with the situated learning theory. This theory of cognition postulates that learning is situated by being embedded within a learning activity, and the respective activity has various facets of context. Furthermore, knowledge to be learned should be presented in authentic contexts. In the **MISSED_IPSims,** the settings and situations are relevant to interprofessional care of an older adult, along with engagement in activities designed to help learners understand interprofessional care as well as clinician-patient social interaction and collaboration in ways that facilitate the learner becoming part of and involved in a "community of practice."

The details of the architecture and building of the **MISSED_IPSims** environments, version can be found in the work of Fernandez, Regts, et al. [26-30]. However, in the next section of this paper, we summarize a case study that elaborates the data flow described in Figure 1. This case study provides an analysis of the different **MISSED_IPSims** environment components and their interactions with other components. The case used a version of the **MISSED_IPSims** environment with component functionality that we implemented in a study of health sciences education.

3 Results and Discussion

Herein, we report a study that was concluded in March 2013. A second and more technical paper will be published that provides the complete data analysis, technical specification of the **MISSED_IPSims** components used and their articulation as a platform. For this methodology paper, we provide an overview of how **MISSED_IPSims** was part of instructional design and evidence-based learning in a course in the Faculty of Health Sciences at the University of Ontario Institute of Technology (UOIT). The research examined the efficacy of the **MISSED** environment components to identify students' misconception development in a Nutrition course for Health Sciences majors, taught as a hybrid course offering, with enrollment including students from Nursing, Medical Technology, and Health Information Management Programs.

The research was approved by the UOIT Research Ethics Board [Case #09-027]. Research support was from extramural funding, supported by the Ontario Ministry of

Health and Long-Term Care and Health Force Ontario grants to Dr. Tashiro and a Social Sciences and Humanities Research Council of Canada grant awarded to Drs. Vargas Martin and Tashiro. Health Sciences students in one course with two sections (Nutrition) were recruited to participate in the research. We had 71 or 147 possible students volunteer for the research. Of the 71 subjects 58 provided complete research instruments. **MISSED_IPSims** components were utilized as described below.

Hybrid Course Internet Component.— In our study, this component was a hybrid environment in which a student could engage in teaching-learning-assessment activities. Learning activities were a set of independent or integrated learning objects, with organization and access ranging from simple pick-one-learn-one to engaging with interacting suites of learning activities, including nesting within a Learning Management System (LMS). The Nutrition course that was studied had a taxonomic identification the same as shown in Figure 1, cell I, with an online component and taught as a hybrid course. There were Weblinks to a variety of learning activities, including the **MISSED_IPSims** interprofessional care simulation used for this study.

Learning Object Repositories.— These repositories are collections of learning objects, each object tagged with one or more metadata that allow them to be found and called into a learning activity. Herein, we use "learning object" in the broadest sense to include content and activities of various kinds of text, images, animations, simulations, educational scaffolding, learning assessments, and diagnostic feedback, but also course and lesson plan organizers and instructor authoring tools for adding new learning objects.

Inclusive-Adaptive Interface.— Regardless of the structure of the Hybrid Course Internet Component, all **MISSED** Environments were designed to have an Inclusive Adaptive Interface, which we created as a set of engaging interactions that allow the environment to collect data on the student's needs and preferences, then creating or updating the Student Profile database as well as the Electronic Learning Record. We used a simplified Inclusive-Adaptive interface, as UOIT is a laptop university with standardized hardware and software for each student. All Health Sciences students in this study had the same hardware and software access potential.

Student Profile.— This Profile is a dynamic database that tabulates and updates access needs, preferences at each moment of interaction, thinking styles, and special needs (hearing, vision, neuromuscular, cognitive impairment). The Profile evolves as the learner continues to use the environment. Student Profile data stream to a MatchMaker Engine that selects an Instructional Design Template. The Instructional Template (IDT) can be based on a theoretical model for cognition and behavior change, as well as based on specifics of course content and curricular objectives, but is informed by the student's needs and preferences. The IDT is read by an Assembler engine that searches Learning Object Repositories to find and collate learning activities, resources, educational scaffolding, learning assessments, and feedback for the student's personalized educational environment. The Assembler then organizes learning objects and creates a Web-based Educational Environment.

Electronic Learning Record (ELR).— The Electronic Learning Record (ELR) is analogous to an Electronic Medical Record (EMR) and functions as a dynamic and evolving database and knowledge system that records progress in learning outcomes as well as misconception development. The knowledge system components provide alerts to other **MISSED_IPSims** environment components, for example, areas of knowledge or skills domains that a learner has not developed completely according to standards set by an instructor or by curricular outcomes objectives. The Electronic Learning Record functions as a dynamic and evolving database, but maintains all records through time. Importantly, modern EMRs are now being built as knowledge systems, and the ELR analogously records progress in learning outcomes as well as misconception development.

For this particular research project, we had to design databases and learning algorithms so that such knowledge system components could be both a complete data record and also provide data feeds and alerts to other **MISSED_IPSims** environment components. Figure 3 diagrammatically shows how conceptual and performance competencies can be tracked, assessed, and stored in databases, but called out and mapped to each other or to other learner attributes (see also discussions of PathFinder and Datum components below). The end result was to develop an ELR as the complete record of a learner's experiences within a series of learning activities, within and across courses, although in this study we looked at only one course. To distinguish between an ELR and a Student Profile, we argue that the ELR represents the complete historical record of a student's process of learning, while the Student Profile is the most recent minimal data set containing the data that provide **MISSED_IPSims** with the most probable learning pathways and educational activities to optimize the student's learning. See more explanatory detail provided below in the Educational Environment and PathFinder descriptions.

Instructional Design Template.— MISSED_IPSims has capacities for allowing instructors or instructional designers to select their preferred theories of cognition and behavior change, with such selections opening options for Instructional Design Template (IDT) consistent with the selections. These IDTs are the analog of Clinical Decision Support Systems in healthcare. The IDTs allow automated but directed searches of Learning Object Repositories to find and collate learning activities, resources, educational scaffolding, learning assessments, and feedback consonant with selected theories of cognition and behavior change chosen by an instructor. The results of the search can then be collated for assembly of the student's personalized educational environment.

UOIT instructors agreed on a particular Instructional Design Template. The idea was to allow student preferences and learning outcomes to evoke adaptive changes in the initial Template, and so adaptive changes throughout the **MISSED_IPSims** for the respective students. As mentioned earlier, we selected a template that was modeled on the situated learning theory. The premises of this theory include a model for learning as situated that is embedded within the activity. Furthermore, that activity has various facets of context, and knowledge and skills domains should be learned within authentic contexts. Using this grounded theory approach, the IDT was constructed so that it would retrieve and collate learning activities, learning resources, learning assessments, and diagnostic feedback consistent with situated learning theory. Such retrieval and collation would result in a particular type of Educational Environment, one grounded in situated learning theory.

MatchMaker Engine.— We developed the MatchMaker Engine to form a bridge between an individual learner and an instructor's educational goals for a course. Receiving Student Profile data, the MatchMaker Engine was designed to allow the first adaptive changes for individual students. The analogy here is found in the way all major search engines track usage patterns when an individual is engaging within the Web. The usage patterns are analyzed to project preferred usage patterns as well as preferred content. However, search engines do not generally directly assess an individual's access needs, preferences for engaging with the Web, and certainly probe neither an individual's cognitive processing and motivation to engage in effortful cognitive endeavor nor motivation to act on knowledge gained.

We built the Learning Object Repositories to accommodate many different types of learning objects for a particular topic area in a particular knowledge domain, with equivalent forms of learning objects that can be selected by MatchMaker, and with such selection based on Student Profile Data. Furthermore, we built the **MISSED_IPSims** to have capacities for multiple Learning Object Repositories that could be integrated in ways that together would allow linked Repositories to have all of the learning objects for a particular course. The MatchMaker Engine is the go-and-get solution that asks the Student Profile what types of learning objects should be mapped to the IDT. Metadata to any learning object identifies its potential use under certain conditional logics, for certain types of learning, within certain types of knowledge or skills domains, within certain type of courses at certain levels of academic curricular structure (or prior knowledge), with certain types of educational goals, and within certain grounded theory frameworks for cognition and learning as well as behavioral expression of what has been learned..

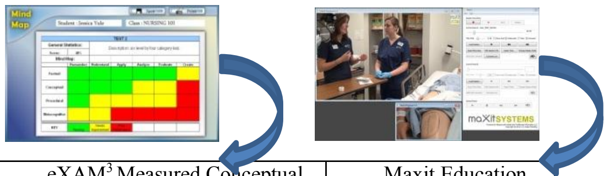
Assembler Engine.— While the MatchMaker Engine provides metadata on an Instructional Design Template for mapping to the metadata of learning objects within the Learning Object Repositories, the Assembler Engine selects and organizes the specified learning objects and creates a Web-based personalized teaching-learning-assessment-diagnostic Educational Environment. In a simplistic sense, we built the MatchMaker to load metadata to the various modules of the IDT. The IDT was built as a multidimensional array that can be filled with metadata related to the types of learning resources, activities, assessments, educational scaffolding and diagnostic feedback that are likely to optimize a student's learning. After the MatchMaker loads the IDT with the metadata for a personalized educational experience, the Assembler Engine reads the Instructional Design Template and provides instructions to create the personalized Education Environment by using the IDT as an organizing framework. The Assembler can then load into this framework learning activities, resources, educational scaffolding, learning assessments, and feedback for the student's personalized educational environment.

Educational Environment.— Within a Hybrid Course, the interactions of the MatchMaker and Assembler Engines organize and present an Educational Environment, which is a suite of integrated learning and assessment activities, diverse learning resources, scaffolding, and feedback arrays. These all are personalized to the learner. While many universities and colleges have hybrid courses within learning management systems that are somewhat static, LMSs are evolving rapidly and will soon be able to offer personalized educational environments.

PathFinder.— PathFinder creates place-time stamps for every place within the Educational Environment in which the learner engages, including engagement with any learning object or sub-element of a learning objet nested within a learning activity, resource, or scaffolding element made available to a learner. PathFinder also monitors all assessment activities, collecting data on each assessment and retrieves sub-elements of any assessment in which the learner is working. This place-time data set is a record of decisional sequela (sometimes called Space-Time worm) for the learner. Basically, the data reveal the sequence of choices made, actions taken within the Educational Environment, and time spent in such places and actions. The first two columns in the data table of Figure 3 show representations of the sequences of places (P_1 to P_N) and the time spent in each place (T_1 within place P_1).

When the student completes a learning outcomes assessment within eXAM[3], which measures conceptual competencies, the assessment items in the respective cells of the cognitive taxonomy are mapped to the places in the Educational Environment where there were related learning activities and resources.

So, for some conceptual competency assessment item related to learning activities in place P_1, there is an assessment score CC_1. Analogously for knowledge transfer measures, there are conceptual competency transfer assessment items related to learning activities in a place. So, for place P_1, there could be an assessment score related to knowledge transfer CCT_1. Additionally, when a student in a course is assessed for a knowledge or skill domain implementation, there is a score that also can be mapped to a place in the Educational Environment. So, if there is a place P_2 in the Educational Environment that covers a particular area of knowledge related to a specific skill, the performance competency measure PC_2 would be mapped to that place, as shown in the P_2 row of the schematic data table in Figure 3. For our use case, in the Nutrition course, we would have a set of data arrays for each part of the Educational Environment they visited. Figure 3 represents a very simplified



Places Visited	Time Spent in Place	eXAM[3] Measured Conceptual Competencies		Maxit Education Measured Performance Competencies
		Knowledge	Transfer	
P_1	T_1	CC_1	CCT_1	PC_1
P_2	T_2	CC_2	CCT_2	PC_2
:	:	:		:
:	:	:		:
P_N	T_N	CC_N	CCT_N	PC_N

Fig. 3. Data Generated for Each Moment of a Student's Engagement

representation of such arrays for a single learning activity with N parts or .engagement areas. We then can examine place-time decisional sequelae for a particular learning activity:

(1) Knowledge or Skill Mastery: After completing a learning activity related to a particular knowledge or skill domain, a student completes a learning outcomes assessment within eXAM^3 (a learning assessment system based on a cognitive taxonomy chosen by an instructor; described more completely below). Mastery or understanding of each knowledge domain or skill is measured by the set of {CCi} data summed across the places where learning activities related to the skill were found in the Educational Environment, so summing {CCi} for places $P_{i,\, i=1 \text{ to } N}$. A summary database table similar to Figure 3 provides data to Pathfinder and DATUMM on where skills and knowledge to be learned were found within the Educational Environment and how well the student did on knowledge assessments related to each place where skills development and other types of learning activities were located. Again, we note our misconception definition: The state of being unaware that your own knowledge domains and cognitive processing are incomplete or incorrect. Misconceptions are revealed as outcomes in the eXAM^3 AssessMap as assessment cells within the taxonomy indicating incorrect or incomplete knowledge.

(2) Knowledge Transfer: Each student also can complete a knowledge transfer assessment within eXAM^3 or a behavioral expression of what has been learned using a video capture and analysis system called MAXIT EDUCATION. Knowledge transfer related to each knowledge or skill domain can be measured by the set of {CCTi} data summed across the places where learning activities related to the skill were found in the Educational Environment, so summing {CCTi} for places Pi, i=1 to N. The MAXIT EDUCATION system can use an eXAM^3 AssessMap or any kind of rubric, thus providing a summary of how well a student did in knowledge transfer during behavioral expression of knowledge. A summary database provides more detail on where the knowledge and skills domains expressed during behavior could have been learned within the Educational Environment. The MAXIT SYSTEM AssessMap or rubric would show how well the student did on assessments related to each place where knowledge-skills learning activities were located. Misconceptions are revealed as outcomes in assessment cells in the AssessMap or rubric that indicated the student's knowledge transfer was incorrect or incomplete.

eXAM^3.— This assessment engine assesses learning outcomes within a cognitive taxonomy selected by the faculty member (e.g., Bloom's Revised Taxonomy or the item categories and levels of difficulty found within professional licensing examinations such as the American NCLEX-RN for professional nurse certification). eXAM^3 is essentially an engine that can assess conceptual competencies and knowledge transfer activities that do not involve real-world behavioral actions to demonstrate knowledge and skills, pattern recognition, and problems solving.

MAXIT EDUCATION.— Maxit is a video capture and analysis system that allows filming and automated analysis of learners expressing knowledge during real-world activities or simulations within a face-to-face environment (e.g., Nursing skills lab, clinical practicum in a hospital or with a standardized patient). Students are monitored during learning-demonstration activities. Faculty score students from observations of the videos, using an AssessMap like that for eXAM^3 or a rubric of their own design. AssessMap or rubric data are streamed to the DATUMM engine of **MISSED_IPSims**.

DATUMM.— PathFinder, Maxit Nursing Education, and eXAM^3 stream a learner's data to a data analysis and knowledge system called DATUMM – Data Ultrastructure Modeling and Mining. DATUMM in turn creates new information about the student, and sends this information back to the Student Profile and Electronic Learning Record. The Profile and Record use these data and information to facilitate adaptive changes that optimize a student's learning process and learning outcomes. During this research study, DATUMM was studied extensively using different types of data mining methodologies to examine how to refine DATUMM as a knowledge system and make it interoperable with a variety of dashboards that provide both instructors and students with sensible interpretations of an individual student's learning process, their outcomes, misconception development, and remediation strategies. Another focus was coupling of DATUMM to the Student Profile in ways that allow information about a student to be encoded in the Student Profiles in ways that evolve the Profile and set new options for the student's inclusive-adaptive education which in has patents pending [15-18].

We have been able create an inclusive-adaptive educational environment and then study that environment within a real-world course setting offered in the Faculty of Health Sciences at the UOIT in Canada. UOIT is a research-intensive provincially-supported university and is the only laptop university in the province of Ontario. Our research provided evidence that an adaptive-inclusive environment could be built and work with learning management systems, such as the WebCT LMS used by UOIT. In addition, the research provided strong support that we could measure misconception development and that the remediation of such misconceptions could be much more rigorous and automated than is currently possible in the majority of hybrid course, especially large enrollment hybrid courses.

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Overview of Continuing Education in Hong Kong

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Abstract. This paper summarizes the continuing education in Hong Kong. Because there is a shortage of supply of public-funded post-secondary education in Hong Kong, the public-funded institutions have established a number of continuing education units together with a number of private institutions to provide self-financed post-secondary education. Besides, Hong Kong government also solicits continuing education to public in order to enhance the competitive advantage of the city. Even though the participation rate is gradually increasing but the rate is still lower than that of western societies. This paper studies the motivation and obstacles for learners to pursue continuing education in terms of age segmentation as well as the strategies to develop appropriate programmes for relevant target learner groups.

Keywords: continuing education, Hong Kong, post-secondary education, Continuing Education Fund, Hong Kong Diploma of Secondary Education

1 Introduction

Continuing education is also known as further education or adult education. The term commonly refers to any post-secondary learning activities and programmes. Tertiary education is definitely important to ensure the competitive advantages of a nation / city, and continuing education will improve and enhance the core competence of the workforces as well. Unfortunately the public-funded tertiary education places in Hong Kong is not enough to accommodate qualified graduates from the Hong Kong Diploma of Secondary Education (HKDSE), and self-financed post-secondary programmes therefore become alternative paths for students to continue their post-secondary studies. This paper will reveal the supply and demand situation of the public-funded and self-financed post-secondary programmes in Hong Kong, and will discuss the growth opportunity of continuing education in this city. Moreover, this paper will also study the motivations and obstacles for the learners to pursue their continuing education, and will provide recommendations for the providers of continuing education programmes in Hong Kong.

2 Post-secondary Education in Hong Kong

In Hong Kong, there are eight institutions funded by University Grants Committee (UGC). These UGC-funded institutions are directly financed by Hong Kong Special

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 377–389, 2013.

Administrative Region (SAR) government to provide higher education. UGC closely controlled the number of students admitted by each institution.

As it is commonly known that there is a serious problem of shortage of undergraduate degree places in Hong Kong. The associate degree system was introduced to Hong Kong by Tong Cheek Hwa, the first Chief Executive of Hong Kong SAR, to partially alleviate the problem. According to the previous Hong Kong's Director of Education Cheung Kin-Chung said in 2001 "the SAR government is committed to increasing gradually the provision of tertiary places in the coming ten years, with the aim of providing tertiary education for 60 percent of the young people in the appropriate age group" [11]. The associate degree and higher diploma programmes are commonly referred as sub-degree programmes. They are equivalent to the first two years of a four-year degree programme. Because the entrance requirement for sub-degree programmes is lower than that of degree programmes, sub-degree is generally regarded as an inferior substitute to a degree programme.

In recent years, Hong Kong government devotes more resources in post-secondary education. Table 1 shows a clear increasing trend in total student enrolment in UGC-funded institution.

Table 1. Number of students in UGC-funded institutions [10]

	2007/08	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Total enrolment of students	71,020	72,067	73,552	74,588	75,597
Total enrolment of undergraduate students	53,359	55,050	56,610	57,565	58,412
Student enrolment of first-year-first-degree places	15,427	15,715	15,729	15,960	16,354

According to Hong Kong Examinations and Assessment Authority (HKEAA), there are over 70,000 secondary school graduates each year in Hong Kong [4]. Among these secondary school leavers, over 26,000 and 47,000 students meet the entrance requirement for degree and sub-degree programmes respectively. However, only around 16,000 students are admitted to undergraduate degree programme each year [10]. Therefore, there is a great demand for other alternative study paths.

The Hong Kong government's original goal for setting up the UGC-funded institutions is to provide public-funded post-secondary education to Hong Kong residents. To address the demand for other alternative study paths, the UGC-funded institution put a lot of resources in continuing education. As shown in Table 2, 17 continuing education units are established by 8 UGC-funded institutions.

The UGC-funded institutions have set up a number of continuing education units to provide self-financed education to this group of students and other adult learners. Some of them are specialized in providing sub-degree programmes or self-financed degree programmes to those secondary school graduates who have met the entrance requirement but have not been admitted by UGC-funded institutions because of shortage of degree programme places. Some of them are jointly founded by UGC-funded institutions and charitable organizations, such as Tung Wah Group of Hospitals and Po Leung Kuk. The charitable organizations aim to provide post-secondary education opportunities to secondary school graduates and reduce the pressure generated by shortage of degree programme places.

Table 2. Division or school of continuing education founded by UGC-funded institutions

UGC-funded institutions	Division or school of continuing education
City University of Hong Kong (CityU)	1. Community College of City University (CCCU) * 2. School of Continuing and Professional Education (SCOPE)
Hong Kong Baptist University (HKBU)	3. School of Continuing Education, Hong Kong Baptist University (SCE, HKBU) 4. College of International Education (CIE) * 5. BNU-HKBU United International College (UIC) [1]
Lingnan University (LU)	6. The Community College at Lingnan University (CCLU) * 7. Lingnan Institute of Further Education (LIFE)
The Chinese University of Hong Kong (CUHK)	8. School of Continuing and Professional Studies, The Chinese University of Hong Kong (CUSCS) 9. The Chinese University of Hong Kong – Tung Wah Group of Hospitals Community College[2] *
The Hong Kong Institute of Education (HKIEd)	10. School of Continuing and Professional Education (SCPE)
The Hong Kong Polytechnic University (PolyU)	11. School of Professional Education and Executive Development (SPEED) 12. Hong Kong Community College (HKCC) *
The Hong Kong University of Science and Technology (HKUST)	13. Office of Continuing and Professional Education (OCPE)[3]
The University of Hong Kong (HKU)	14. HKU School of Professional and Continuing Education (HKU SPACE) 15. HKU SPACE Community College * 16. HKU SPACE Po Leung Kuk Community College[4] * 17. Centennial College #

Remark: * Mainly offer self-financed sub-degree programmes (including Associate Degree and Higher Diploma)
Mainly offer self-financed degree programmes

Apart from continuing education units established by the UGC funded institutions, a number of private institutions have been organised to provide self-financed

[1] Jointly founded by Beijing Normal University (BNU) and HKBU and located at Zhuhai, China.

[2] Jointly founded by CUHK and Tung Wah Group of Hospitals.

[3] A sub-unit under the Office of the Provost to coordinate and oversee continuing and professional education programmes.

[4] Jointly founded by HKU SPACE and Po Leung Kuk.

post-secondary programme. Because of the great demand for self-finance education, the number of self-financed programmes increases significantly in recent years (Table 3). Subsequently, the enrolment of full-time accredited self-financed post-secondary programme increases (Table 4).

The UGC-funded institutions and their continuing education units together with the private institutions totally provide around 20,000 first year degree places and 25,000 first year sub-degree places. Because the number of students meeting the entrance requirement for degree and sub-degree programmes are 26,000 and 47,000 respectively each year, there is still a significant gap between the demand and supply. Even though considerable numbers of self-financed post-secondary programmes have been offered by local private institutions in order to fill-in the gap, shortage of post-secondary programme places and degree programme places still exist in future years.

Table 3. Number of self-financed post-secondary programmes [6]

	2007/08	2008/09	2009/10	2010/11	2011/12
Sub-degree[5]	279	289	306	315	314
Degree[6]	58	57	57	72	97
Top-up Degree[7]		55	59	64	60

Table 4. Enrolments of full-time accredited self-financed post-secondary programmes [6]

	2007/08	2008/09	2009/10	2010/11	2011/12
Sub-degree	43,272	43,702	47,322	52,154	51,796
Degree	6,856	8,584	9,814	10,799	12,003
Top-up Degree		3,342	4,647	6,220	7,177

3 Graduates of Hong Kong Diploma of Secondary Education

According to the press release from Education Bureau [3], there will be about 69,800 graduates from HKDSE in 2013. At present, there are about 22,360 places of local Bachelor's Degree programmes offered by 17 institutes domestically, in which 15,160 places are publicly-funded and 7,100 places are self-financed. Besides, there are about 39,500 places of Sub-Degree programmes offered by 23 institutes locally, in which 9,800 places are publicly-funded, and 29,700 places are self-financed. For those graduates who are not qualified, or do not want, to continue their studies in Degree programmes and Sub-Degree programmes, there are about 11,300 places in Yi Jin Diploma / Foundation Diploma / Vocational Education Diploma offered by various local institutes. Thus, HKDSE graduates would have various choices for their continuing education in 2013.

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[5] Two-year programme which is equivalent to first two years of a four-year degree programme.
[6] Three-year programme (under old curriculum) and 4-year programme (under new curriculum).
[7] Two-year program which is equivalent to last two years for a four-year degree program.

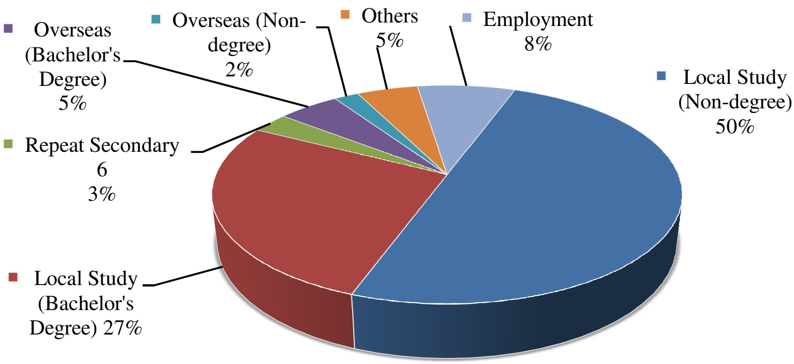

Fig. 1. 2012 HKDSE Graduates

Table 5. Demand in Post-Secondary Programmes [3]

	2013	2014	2015	2016	2017	2018	2019
Students who Fulfilled the Minimum Requirement							
HKDSE (5 Level 2 incl. C&E)[8]	49,000	46,000	44,000	40,000	37,000	37,000	34,000
HKDSE (3322 in core subjects)[9]	27,000	26,000	24,000	22,000	21,000	21,000	19,000
Total Graduates	76,000	72,000	68,000	62,000	58,000	58,000	53,000
Places							
Degree							
Publicly-funded	15,200	15,200	15,200	15,200	15,200	15,200	15,200
Self-financed	7,200	7,100	7,500	8,000	8,000	8,000	8,000
Sub-degree							
Publicly-funded	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Self-financed	29,000	24,500	24,300	24,100	24,100	24,100	24,100
Total Post-Secondary Programmes Places	61,400	56,800	57,000	57,300	57,300	57,300	57,300

According to the survey done by Education Bureau [3] on the continuing education situation of HKDSE graduates in 2012, over 87 percent of the graduates continue to tertiary education, in which 80 percent of the graduates study locally in Hong Kong, and 7 percent of the graduates study overseas (Fig. 1).

Regarding the demand in the post-secondary programmes in coming six years, Education Bureau has prepared a forecast (Table 5) which indicates inadequate

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8 Level 2 in 5 subjects including English Language and Chinese Language in the HKDSE.

9 Level 3 in English Language, Level 3 in Chinese Language, Level 2 in Mathematics and Level 2 in Liberal Studies in the HKDSE.

post-secondary programmes places in the coming five years till 2019. Even though the gap of demand and supply is going to be narrowed in 2019, the post-secondary programmes places still have room to improve since the above estimated figures are merely the number of HKDSE fresh graduates, and there is still a significant gap between the demand and supply of postsecondary education programmes for the public as further education or adult education domestically.

4 Continuing Education in Hong Kong

Last section brings up the subject on full-time postsecondary education. In many countries or areas, continuing education refers to part-time programme offered by higher education institutions or universities through their division or school of continuing education.

Table 6. Persons Attending Part-time or Distance Learning Course by Sex, Age Group and Educational Attainment (Highest Level Attended) in 2011 [1]

Sex	Age	Educational Attainment (Highest Level Attended)				Total
		Secondary	Diploma / Certificate	Sub-degree	Degree	
Male	15-24	3,078	4,583	2,968	5,966	16,595
	25-44	3,296	8,599	6,187	30,189	48,271
	45-64	1,881	2,487	1,514	6,340	12,222
	65+	89	146	38	97	370
	Sub-total	8,344	15,815	10,707	42,592	77,458
Female	15-24	2,818	5,076	2,989	7,378	18,261
	25-44	3,315	12,531	7,151	35,330	58,327
	45-64	1,686	3,633	1,750	5,906	12,975
	65+	31	40	114	63	248
	Sub-total	7,850	21,280	12,004	48,677	89,811
Total		16,194	37,095	22,711	91,269	167,269

Because there is a large gap between the demand and supply of full-time postsecondary education programme, a lot of students are forced to seek other alternative study paths. As shown in Table 6, there are a large number of students studying part-time education programmes.

According to 2011 Population Census, 167,000 Hong Kong people were studying part-time or distance learning programmes (Table 6). The group aged 25-44 is more actively engaged in continuing education. In Hong Kong, female made up around 54% of students attending UGC-funded programmes [10]. Because, people holding degree programme is more active in continuing education (Table 6), female is relatively more active in continuing education than male in Hong Kong.

Even though the local postsecondary institutions offer a lot of full-time and part-time programmes, which still fails to meet the demand. As a result, a number of non-local institutions come to Hong Kong to offer non-local post-secondary programmes.

On the other hand, it is quite easy for overseas institutions to offer their domestic post-secondary programmes to Hong Kong, because the Hong Kong government has relatively easy-going policy on registration of non-local courses [4]. As shown in Table 7, a total of 134 non-local institutions have registered with Education Bureau. They are offering a total of 458 non-local post-secondary programmes in Hong Kong [4].

Table 7. Summary of registered and exempted non-local post-secondary programmes

Level	No. of Registered Programmes	No. of Exempted Programmes
Sub-degree programmes	83	87
Bachelor degree programmes	203	212
Master degree and postgraduate programmes	150	342
Doctoral degree programmes	22	12
Total	458	653

If a non-local post-secondary programme is conducted by a non-local institution/professional body in collaboration with a local institute of higher education, the programme will be exempted from registration. As shown in Table 7, a total of 653 non-local post-secondary courses are exempted from registration.

5 Government Support

The Continuing Education Fund (CEF) was established by Hong Kong government in June 2012 with an allocation of HK$5 billion [12]. It subsidizes adults with learning aspiration to pursue continuing education and training course so as to enhance their ability and competence. Hong Kong resident aged 18 to 65 can reimburse 80% of their tuition fee upon their completion of a reimbursable course approved by the Secretary of Labor and Welfare. The reimbursement is subject to a lifetime maximum of HK$10,000 per qualified citizen and the reimbursement period is limited to 4 years after opening of their accounts.

As the CEF aims to prepare Hong Kong's workforce for the knowledge-based economy, the reimbursable courses are confined to a number of sectors identified by the Hong Kong government, which has recently announced a variety of measures to develop Hong Kong's pillar industries of financial services, tourism, trade and

Table 8. Statistics of CEF courses by sectors [12]

Sectors	**Number of reimbursable courses**	**Percentage**
Logistics	573	7.35%
Financial Services	1,936	24.82%
Business Services	2,926	37.51%
Tourism	512	6.56%
Language	581	7.45%
Design	714	9.15%
Creative Industries	425	5.45%
Interpersonal and Intrapersonal Skills for the Workplace	14	0.18%
SCS Based Courses	120	1.54%
Total	**7,801**	**100.00%**

logistics and business and professional services [13]. The CEF scheme covers Logistics, Financial Services, Business Services, Tourism, Language, Design, Creative Industries, and Interpersonal and Intrapersonal Skills for the Workplace.

In addition to academic programmes, CEF also cover vocational training programmes. Practitioners from industries are invited to set the outcome standards of vocational qualifications, and such specific outcome standards required for different levels of qualifications are knows as Specification of Competency Standard (SCS). The CEF have been extended to SCS[10]-based courses in recent years.

The CEF scheme significantly increases Hong Kong residents' incentive to pursue continuing education. Many education institutions design continuing education programmes which aim at joining the CEF scheme in order to attract students to enrol in their programmes. A large number of programmes have been included by the CEF scheme (Table 8).

These continuing education programmes under CEF scheme are well-received by Hong Kong residents. As shown in Table 9, a total of 684,984 applications have been received. As the objective of CEF is to promote continuing education, the approval of application is relatively relaxed. Among these applications, 683,725 have been completed and 632,499 have been approved. The success rate is 92.5% (Table 9).

Table 9. Statistics of CEF applications by sectors as at 31 March 2013 [12]

CEF Applications	**Cumulative Total**
No. of applications received	684,983
No. of applications under processing	1,258
No. of applications completed	683,725
No. of approved applications	632,499
No. of rejected applications	51,220

[10] Specification of Competency Standards (SCS) is developed by the industries for the vocational sector to identify the specific outcome standards required for different levels of qualifications (QF, 2013).

Hong Kong is a highly commercialized city and best known as one of the international financial center. Therefore, more than 40% of residents decided to pursue continuing education in financial services and business services (Table 10) and more than 60% continuing education programmes are offered in these two areas (Table 8).

Table 10. Breakdown of approved CEF applications by sectors as at 31 March 2013 [12]

Sectors	Approved Applications	Percentage
Language	226,280	35.78%
Financial Services	140,956	22.29%
Business Services	123,020	19.45%
Design	60,288	9.53%
Logistics	33,765	5.34%
Tourism	26,735	4.23%
Creative Industries	9,889	1.56%
Interpersonal and Intrapersonal Skills for the Workplace	6,854	1.08%
SCS Based Courses	4,712	0.74%
Total	**632,499**	**100.00%**

The largest number of residents applies to study language (Table 10), and the percentage of approved CEF applications to study language courses is over 35%. However, the completion rate is not high. Among the reimbursement claim, 60% come from financial services and business services and only 16% come from language (Table 11).

The total reimbursement amount for 650,150 applications is around 3 billion Hong Kong dollars (Table 12). In other words, the average reimbursement amount for each

Table 11. Breakdown of reimbursement courses by sectors as at 31 March 2013 [12]

Sectors	Cumulative Total	Percentage
Financial Services	220,925.00	33.98%
Business Services	173,838.00	26.74%
Language	104,034.00	16.00%
Design	57,588.00	8.86%
Logistics	41,928.00	6.45%
Tourism	30,920.00	4.76%
Creative Industries	10,251.00	1.58%
Interpersonal and Intrapersonal Skills for the Workplace	6,978.00	1.07%
SCS Based Courses	3,688.00	0.56%
Total	**650,150.00**	**100.00%**

application is around 5,000 Hong Kong dollars, which is half of the maximum claim for each resident. One of the possible reasons for the relative low reimbursement percentage is because applicants could not meet the attendance requirement of minimum 80%, another reason is because applicants could not meet the passing requirement of the courses. Nonetheless, the above figures do not include the people who pay for their own tuition in continuing education as well as the people who yet enrol the CEF scheme; thus, there is still room for growth in the continuing education in Hong Kong.

Table 12. Statistics of reimbursement courses as at 31 March 2013 [12]

Reimbursement Claims	Cumulative Total
No. of reimbursement claims received	499,977
No. of reimbursement claims under processing	2,029
No. of reimbursement claims completed	497,948
No. of approved claims	491,843
No. of reimbursed courses	650,150
No. of withdrawn reimbursement claims	1,933
No. of rejected reimbursement claims	4,172
Amount reimbursed	$3,382,869,330.00

6 Analysis of Continuing Education in Hong Kong

Research on the comparison of demand for continuing education amongst adults in the age of 18 - 64 in Hong Kong discovered that only 25.1% and 31.1% participate continuing educations in 2007 and 2009 respectively[13]. When compared these figures with other developed countries, such as, Sweden, Finland, Switzerland, United States, Netherland, whose participation rates in continuing education are 69%, 51%, 50%, 46%, 54% respectively, the participation rate in Hong Kong is still relatively low even though there is a positive growth rate from 2007 to 2009, and henceforth there will be a promising future to develop the continuing education in Hong Kong.

When compared with Macau, the neighbouring city of Hong Kong, the government of Macau Special Administration Region has also launched a similar continuing education fund scheme in July 2011. The government has reserved MOP 500 million (equivalent to HKD 485 million) as the Continuing education Development Fund (CEDF), each qualified Macau citizen, whose age over 15, is eligible to apply MOP 5,000 for his/her continue study [8]. There are 81,298 Macau citizens who have applied the CEDF and totally MOP 142 million have been granted [8], that means each learner has applied MOP 1,748 in average, which is only 35% of their eligible fund. In addition, there are 345,000 working labor in Macau, thus, the percentage of citizen who has enroled the CEDF scheme is only at 23.6% [8], which is even lower than Hong Kong. Thus, the development of continuing education in Hong Kong and Macau still has room to grow in coming years.

Related research also revealed the various learning motives for learners who pursue continuing education as well as the obstacles which hinder their learning [13]. The researchers had successfully interviewed 1,500 adults ages 18 to 64 who were not studying full-time programmes in Hong Kong, the successful rate of the interview was 47%. Table 13 presents the three age groups of the respondents in the research which are segmented as young adult group (18-34), middle-aged group (35-49), and older adult group (50-64) [13].

Table 13. Age Group of the Respondents [16]

Age Group	No. of Respondents	Percentage
18 – 34	598	39.9%
35 – 49	545	36.3%
50 – 64	357	23.8%
Total	1,500	100%

Table 14. Learning Motives for Learners to Pursue Continuing Education [16]

Learning Motives	Age 18 - 34	Age 35 - 49	Age 50 - 64
Personal Interests	42.1%	48.4%	44.7%
Work Ability Enhancement	43.0%	35.9%	29.8%
New Skills Learning	21.5%	23.4%	25.5%
Career Opportunity Advancement	12.0%	2.3%	6.4%
Social Network Expansion	5.8%	10.2%	4.3%
New Job Recruitment	15.3%	10.2%	4.3%
Social Needs Fulfillment	6.2%	7.8%	10.6%
Employer Needs Fulfillment	4.5%	5.5%	14.9%
Pay Raise Expectations	2.9%	0.8%	4.3%
No Special Reasons	0.4%	3.1%	0.0%

Table 14 presents the various motives for respondents to pursue continuing education, and the top three motivations for both three groups are identical, which are personal interests, enhancement of working ability and learning new skills. Seems these three groups share similar motives in pursuing their continuing education. However, regarding the obstacles which hinder respondents' continuing education, each group has several reasons (Table 15). For the age group 18 – 34, the top three obstacles are "no time for learning", "no appropriate course", and "heavy workload"; for the age group 35-49, the top three stoppages are "no time for learning", "not necessary for learning", and "heavy workload"; and for the age group 50-64, their top three barriers are "no time for learning", "aging issue/ health problem", and "not necessary for learning". Among the above obstacles, "no time for learning" is the main problem perceived by both three groups; thus, it is important for the continuing education's providers to acknowledge this issue and to tailor-made suitable programmes for learners who have time restriction, for example, evening classes, weekend classes, or flexible classes for those learners who have shift duties or family burden issues.

Table 15. Obstacles for Learners to Pursue Continuing Education [16]

Obstacles	Age 18 - 34	Age 35 - 49	Age 50 - 64
No time for learning	40.9%	41.8%	31.5%
Heavy workload (overtime, shift, trip)	7.8%	11.0%	4.7%
Not necessary for learning	7.3%	11.2%	12.8%
No interests in learning	5.4%	7.0%	10.9%
Busy in taking care of kids / family	7.6%	9.3%	7.3%
No appropriate course / programme	11.7%	6.9%	5.8%
Lack of financial resources/Expensive Tuition Fee	7.1%	3.7%	3.2%
No special reasons	4.4%	2.6%	1.7%
Aging Issue / Health Problem	0.4%	1.2%	16.7%

From the above information, it implies that employers' support and encouragement of continuing education play an important role as motivation or obstacles for employees to pursue their studies. Thus employer endorsement of continuing education "has a significant impact both on the study life of employees and on their work life" [7]. As being providers of continuing education, it is worthwhile to solicit different methods of employers support and endorsement of continuing education for the employees [7].

Moreover, the continuing education for older adult (age 50 – 64) and senior citizens (age 65 or above) should not be ignored as well. Another researcher also supports elderly continuing education since it reflects the cultural values of traditional Chinese, i.e. ones should keep learning till end of their lives [5]. It is found that elderly could regain their confidence and strength through continuing education; they could enhance their interpersonal communication and boost their self-image after further learning [5]. Thus, providers of continuing education are advised to develop appropriate programmes to serve this segment of learners as well, for example, arts, crafts, performing arts, Chinese medicine, physical exercise, computer and languages [16].

7 Conclusion

Continuing education is undoubtedly a fast developing service in Hong Kong and still has plenty of room to grow in the future. The demand of full-time postsecondary education programmes for HKDSE graduates are yet to be fulfilled in spite of considerable numbers of self-financed post-secondary programmes have been offered by both public-funded universities and self-financed private institutions locally. In addition, the participation rate of the CEF scheme in Hong Kong is yet matured, it only accounts for 31% enrolment rate when compared with the rates of other western countries which have average 50% participation rates in continuing education. Researchers from several local universities also support that the development of continuing education in Hong Kong still has room to grow in coming years especially in the elderly learners segment. In order to nurture and enhance learners' motivation in pursuing continuing education, providers of continuing education programmes are advised to design flexible programmes for the busy working class, to solicit employers support of continuing education, and to develop more appropriate programmes for the elderly learners in Hong Kong as well.

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Integration of Placement in Higher Education to Provide Holistic Education

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Abstract. Traditionally, hybrid learning is defined as an education programme which combines traditional face-to-face classroom instruction with online learning. Having implemented hybrid learning for a decade, educators continue investigate hybrid learning and integrate new elements in the model. Under the Quality Enhancement Grant Scheme awarded by Education Bureau of the Government of the Hong Kong Special Administrative Region, Caritas Bianchi College of Careers and Caritas Institute of Higher Education aim to integrate placement programme into formal curriculum so as to provide a holistic education with the support of an internal developed system in the two colleges. This paper review the importance of placement programme, and the necessity of cultivating students' practical ability and employability to avoid employers' bias against the fresh graduate students in Hong Kong. This paper also shares the experience in developing and integrating the placement programme in the Placement Information System; as well as reviews various difficulties and related issues in implementing the placement programme at the two colleges.

Keywords: hybrid learning, placement, internship, higher education, holistic education, employability, Education Bureau, Quality Enhancement Grant Scheme.

1 Introduction

Traditionally, hybrid learning is defined as an education programme which combines traditional face-to-face classroom instruction with online learning [6, 8, 17, 22]. Educators aim to maximize the effectiveness of learning and teaching through a mixture of teaching strategies [20].

Having implemented the hybrid learning model for a decade, educators have accumulated some good practices and collected a lot of useful feedback from stakeholders. Educators start to review hybrid learning and investigate how to effectively implement hybrid learning model.

The Centre for Excellence in Teaching and Learning at the University of Ulster has developed a Hybrid Learning Model [4] based on the 8 Learning Events, developed at the University of Liège, Belgium [14]. There is a trend to integrate different learning

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 390–400, 2013.

and teaching activities in an education programme so as to provide better learning and teaching experience.

The higher education sector in Hong Kong follows the global trend to implement hybrid learning [11, 20] by supplementing traditional face-to-face classroom education with online e-learning. In addition, higher education institutions in Hong Kong introduced placement programmes to their formal education programmes. For example, students at The Hong Kong Polytechnic University [19] are required to complete a certain number of hours of placement programme under the Work Integrated Education in order to fulfil the mandatory graduation requirement staring from 2005/06.

The main objective of placement programme is a practical training at industrial setting which connects classroom theories to workplace applications. Caritas Bianchi College of Careers (CBCC) and its sister college, Caritas Institute of Higher Education (CIHE), aim to provide holistic education to the community. The two colleges consider that the placement programme is essential to support holistic education. With financial support from Education Bureau (EDB) of the Government of the Hong Kong Special Administrative Region under the Quality Enhancement Grant Scheme (QEGS), the two colleges implement a placement programme, which is integrated into formal curriculum to provide a holistic education.

Through the summer placement experiences, students have an opportunity to integrate theories with practices and to improve their practical and communication skills and their industrial knowledge. Subsequently, students' employability are significantly enhanced.

This paper shares our experience to integrate the placement programme in our formal education curriculum. On the other hand, we also discuss a number of difficulties and related issues during our implementation of the placement programme at the two colleges.

2 Essential of Placement Programme with Higher Education Curriculum

The youth unemployment has been one of the major concerns in the global labour market. Youth unemployment in Hong Kong is a serious problem [15]. According to the Census and Statistics Department of Hong Kong Special Administrative Region [3], the young adults group (aged 20-29 years) and the teenage group (aged 15-19 years) have the maximal number of unemployed persons and the highest percentage of unemployment rate respectively among all the groups (Table 1).

Table 1. Unemployment statistics by age group in Hong Kong, 2012

Age Group	Number of Unemployed Persons	Unemployment Rate
15-19	5,900	13.9%
20-29	40,000	5.3%
30-39	22,800	2.4%
40-49	27,600	2.8%
50-59	23,700	2.9%
≥60	4,400	2.0%

The youth unemployment is a common problem in many countries [15]. In the study conducted by the Government of Hong Kong Special Administrative Region [7], most of economics show a very high level of youth unemployment rate with significant worsening over a decade earlier upon their bleaker macroeconomic conditions.

As a result of policy of the Government of Hong Kong Special Administrative Region Hong Kong, around 60% of Hong Kong secondary school leavers receive tertiary education nowadays. The rapid expansion of higher education in recent years results in a huge increase in the supply of graduates. Higher education in Hong Kong usually provides a professional or vocational training to students before they enter the workforce.

The over-supply of graduates has generated very keen competition for jobs. The graduates without working experience face increasing pressure when searching for jobs [15]. Each year, more than 10,000 fresh graduates could not find a job upon their graduations [13].

Feedback from employers indicates that some graduates are not well prepared for the real workplace. Survey of companies who have hired fresh graduates in either this year or previous year identified the common weakness of fresh graduates [10]. More than half of the companies are not satisfied with the graduates' ability to work independently (Table 2). It is desired that a higher education programme can provide relevant training to address the common weakness of fresh graduates and prepare them ready for the real workplace. Subsequently, the employability of fresh graduates can be enhanced.

Table 2. Weakness of fresh graduates identified by companies who have hired fresh graduates in either this year or previous year

Weaknesses of fresh graduates	Percentage of companies
Unable to work independently	58%
Unable to think critically	46%
Poor communication skills	35%
Poor working attitude	33%
Poor analytical skills	28%
Irresponsible	26%
Not willing to follow instructions	25%
Not a team player	12%
Not creative	9%
Not eager to learn	4%
Stick to old ways	0%
Others	7%

A recent fresh graduates employment survey [10] shows that only 27% of companies are willing to hire fresh graduates. 73% of companies are not willing to hire fresh graduates. However, 83% of companies consider that previous work experience is essential. Therefore it is essential to integrate the placement into higher education programmes so as to provide them practical work experience. Otherwise, their employment chances will be significantly affected.

Besides, a major local newspaper recently revealed a 26-year old young man, who is a Master degree holder in Statistics (with an average 3.6 GPA out of 4.0) from a well-known university in Hong Kong, could not find a permanent job for three years since his graduation in 2008 [1]. This student claimed that he had worked for two companies before but he was ultimately fired in a very short period of time. He had sent over 200 letters for applying jobs in these three years but no success in his applications at all; and he had applied the Support for Self-reliance (SFS) Scheme[1] for living for one and half years already. Ms Alexa Chow, the managing director of Central Human Resource Consulting Limited commented to the newspaper that this is a typical stereotype of fresh graduates nowadays in Hong Kong, i.e. highly educated students but hardly capable employees. Ms Chow also warned that fresh graduates without proper working experiences would have difficulties in finding their first job in the marketplace [1].

Henceforth, in recent years most colleges and universities acknowledge the importance of placement programme, and they are using various channels to carry out student internships and professional trainings to cultivate students' practical ability and employability; in the meantime, CCBC and CIHE are two of the tertiary institutes which implement internship placement programmes in selected curriculums.

3 Implementation of Placement Programme at the Two Colleges

With the support from Education Bureau, Caritas Bianchi College of Careers and Caritas Institute of Higher Education implement placement programmes within the colleges' formal curriculums to provide holistic education.

3.1 Integration of Placement with Formal Curriculum

As the two colleges recognise the importance of integration of placement with formal curriculum, there is a general policy to review the placement programme at the formal curriculum.

In the recent programmes validation or revalidation exercises, placement programme has been stipulated as graduation requirements for a number of programmes. The programmes with placement requirement include the follows:

- Bachelor of Business Administration (new streams)
- Bachelor of Social Sciences
- Higher Diploma in Hospitality Management
- Higher Diploma in Pharmaceutical Dispensing
- Higher Diploma in Social Work
- Professional Diploma in Property Management
- Diploma in Property Management

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[1] The Support for Self-reliance (SFS) Scheme is a programme under the Comprehensive Social Security Assistance (CSSA) Scheme in Hong Kong, which aims to encourage and assist unemployed applicants aged 15 to 59 to secure employment to move towards self-reliance while providing them with a minimal financial assistance (Social Welfare Department 2013).

For the above programmes, sufficient placement places have been secured. For some programmes, the availability of placement places is subjected to a number of uncertainty and constraint; thus, placement programme will be listed as an optional programme under these programmes, such as Higher Diploma in Design, Higher Diploma of Accounting Studies, Higher Diploma in Corporate Management and Higher Diploma in Computing Studies.

For programmes with a formal requirement of placement programme, academic staff in the corresponding department will be responsible of the administration of the placement programme. Placement opportunities will be provided to other students by the Student Affairs Office (SAO).

A placement operation manual has been developed to regulate the implementation of placement programme at different departments.

3.2 Support for Placement Programme

The two colleges have newly recruited two staff members to support the Placement Programme. The Placement Coordinator contacted potential placement providers in different sectors. Memorandums of Understanding (MOUs) have been signed with a number of companies to establish a long term cooperative relationship. These companies agree to provide the placement vacancies for our students

When liaising with potential employers, some of them would like to organize recruitment talks to our students. A number of recruitment talks have been organised in the campus with help of the Placement Coordinator.

At the same time, a series of training workshops are offered by the Placement Counsellor to the students at the two colleges to enhance their employability. In the first semester of 2012/13, fifteen training workshops and seminars have been delivered. The nature of workshops includes the follows:

- Job hunting skills
- interview skills
- career life planning
- communication skills
- teamwork skills

Besides, as one of the colleges' missions is "*to produce responsible and respectable graduates who are academically and professionally well educated and can fulfil the role of making contributions to the social and moral well-being of the community*" [2], the two colleges also invited the Equal Opportunities Commission, a statutory body set up by Hong Kong government to implement anti-discrimination legislation [5], to give a seminar on "Sex Discrimination", "Sexual Harassment" and "Methods to handle Sex Discrimination and Sexual Harassment" in workplace for the students who will be joining the internship programmes in this summer as well.

These workshops increase students' understanding of workplace and equip their essential skills for the workplace. Moreover, the training workshops can benefit students' employability and strengthen the competitiveness.

In addition, before arranging students to internship, CIHE also requires students of the Bachelor of Business Administration in *Marketing and Event Management*, *Hotel Management* and *Tourism Management* programmes to take two non-credit bearing modules for fulfilling placement requirements, which are "Professional Etiquette" and "Professional Development", in order to enhance their capability and employability skills in the marketplace.

In the module of "Professional Etiquette", students will acquire practical knowledge of professional etiquette in order to meet the diversified and dynamic demands which they are likely to encounter in the workplace. There are four workshops provided in form of seminars presented by professional speakers on four different topics including Grooming Techniques, Table Manner, Art of Socializing in a Cocktail Reception, and Being a Hong Kong Ambassador of Hospitality. Students are introduced to the proper concept of building up their professional self-image and knowledge for their future position and career development.

In the module of "Professional Development", students will acquire first-hand industrial experience with relevant industry. The course focuses on making students aware of the issues and problems related to the industry. The experience enables students to demonstrate the ability to understand and analyse the relationship between different sections of the host company or organisation. Students should be able to gain an in-depth knowledge of working practices and broad understanding of how the host organisation operates. There are six sessions of workshop provided in a form of tutorials presented by professional lecturers on the special topics that are essential for students' preparation for their internship. The topics include interview skills, resume writing, job vacancy assessment and applications, career development, the adaption of new working environments and occupation health and safety.

3.3 Placement Information System

A placement information system has been developed to provide placement and job vacancy information to the students. The system allows students and employers to register for finding jobs and posting job advertisements respectively. An automatic matching system has been developed to optimize the matching process for students and potential placement opportunities.

Students are required to register their information through this online system, such as, education background, working experience, languages, skills, type(s) of job interested, preferred work location(s), expected salary range, etc.; the Placement Information System will then generate a personalized Curriculum Vitae (CV) for them; such information will then be stored in the system for the placement colleagues to arrange appropriate internship and part-time employment for the students, and full-time employment for the graduates and alumni of the two colleges.

Employers may also register their job vacancy through this online system directly, and such vacancy will be posted online for the students of two colleges to search. The matching system will facilitate the Placement Counsellor to identify the most appropriate candidates for the position, to inform those identified students, and to arrange interviews with the employers accordingly. On the other hand, if any students have interest in the vacancy on the Placement Information System, he/she may also either contact the placement counsellor for further details or simply apply the position through the online system.

The Placement Information System can better provide placement and job vacancy information to students; and such automatic matching system can optimize the matching process for students and potential placement opportunities as well.

4 Difficulties and Related Issues

During implementation of the placement programme at the two colleges, we face a number of difficulties. This section will share our experience in addressing these difficulties and related issues.

4.1 Legal Issues

The students usually do their placement in their summer holiday. Employer usually considered that the placement students do not work effectively. It takes a period of time for the students to adapt to the workplace and the employers need to provide some on-job training. However, the students need to return to school soon after they acquire the essential skills required for their positions.

The Statutory Minimum Wage (SMW) came into force on 1 May 2011 [12]. The rate for SMW was initially set at $28 per hour.It was increased to $30 per hour with effective from 1 May 2013.Under the Minimum Wage Ordinance [16], employers are required to pay salary to employee at a rate which is not less that the SMW rate.

Due to the oversupply of degree graduates, some employers offered lower wages to hire the graduates and therefore dragged down the salaries of university graduates and associate degree holders in recent years [15].The average starting salary for university graduates is around HK$10,000 [10].With the current rate for SMW, the minimum monthly salary is between HK$7,000 - $8,000.Because the different between the average salary of a degree graduate and the minimum monthly salary is not significant, most employers are reluctant to offer placement places to students.Moreover, some students in the two colleges are studying sub-degree programme, which is equivalent to the first two year of a four-year degree programme.It will be more difficult to get placement places for these sub-degree students as well.

For those programmes where placement is a compulsory or elective component, the student will be exempted from Minimum Wage Ordinance [16].The two colleges will issue letters to the employers to certify that the students are studying accredited programme and the placement programme are endorsed by the colleges.Then, the students will not be bounded by Minimum Wage Ordinance to take up an employment as their placement.

A small number of programmes in the two colleges have no formal arrangement of placement programme.Students can still enjoy an exemption period of 59 days from the Minimum Wage Ordinance. Sometimes, some students are luckily to get a placement job with salary higher than the SWM rate which all depends on employers' discretion.

4.2 Alternative Arrangement of Placement Programme

For some programmes with professional training, such as Higher Diploma in Pharmaceutical Dispensing and Higher Diploma in Social Work, students on the half way of study are not qualified to work independently in the workplace.They must work under close supervision of a qualified person.The two colleges collaborate with non-profit-making organisations and government units to provide placement programmes to the students.Because human and other resources are required to provide appropriate training to these groups of students, the two colleges pay a fixed-amount of money to their collaborative partners to cover their cost for the training programmes.

As these groups of students will receive training during their placements, they have no employment relationship with the host organisation; hence, no employment contracts or employment commitment would be stipulated.As a result, the students in these programmes do not receive any salary in their placement.The Minimum Wage Ordinance [16] does not apply to these groups of students.

4.3 Timetabling Issues

The students usually conduct their placement programmes during summer holiday.Students at different institutes are competing placement places at the summer holiday.In employers' point of view, they could not provide too many placement vacancies at the summer holiday to fulfil the demand.At the same time, they prefer a more steady supply of placement students, and they wish to have some placement students to work in the organisation other than summer holiday.

After considering these factors, the colleges make some special arrangements in the students' timetables.For some programmes, such as Social Work, students take extra credits during the first few semesters.Subsequently, students are released a few days per week to take up part-time placement work in their last semester.For some programmes, such as Pharmaceutical Dispensing, students are required to study extra credits during summer semester, so that they are able to take up full-time placement programme in one of their regular semesters in Fall or Spring.

4.4 Community Service Requirement

As two colleges recognize the importance of work experience, they have introduced mandatory community service to their higher education curriculum.Sometimes, it may be difficult for students in certain programmes to find placement places.The community service requirement ensures that the students are connected with the community.

Two colleges require all sub-degree and degree students to perform a fixed number of hours community service in order to fulfil the requirement for graduation.The mandatory community service extends the education beyond classroom to the community.Through community service, students' social skills and communication skills are greatly enhanced.Moreover, community service also helps the students to build their leadership skills.

On the other hand, the community service requirement in fact is aligned with the mission and vision of two colleges [2].Some students continue to contribute themselves to community service after their graduation.

5 Conclusion

Students at the two colleges are placed in commercial companies and non-profit-making organizations.Related survey shows that the students are benefiting from this placement program in a variety of ways, including:

- Student interpersonal and communication skills are greatly improved through their working experience in a real workplace;
- Students have opportunities to apply their knowledge in the workplace and thereby gain some understanding of the skill requirements required when they enter the workforce;
- It provides students opportunities to apply classroom knowledge.The experience gained greatly enhances teaching effectiveness, as practical experience is linked to theory.Hence, it significantly enhances the students learning experience;
- The working experience gained and communication and social skills developed through the placement enhances student employability;and
- Students are able to establish career goals and objectives upon conclusion of the internship experience.

On the whole, the placement programme project enables students to improve their learning experience as well as enhance their employability in the workplace since this project provides the placement companies greater opportunity to understand the skill level of the students which will also increase the placement companies' recognition of the two colleges' academic qualification and students' working attitudes and quality standard.

Acknowledgement. The project *Placement Programme to Support Holistic Education* is funded by the Education Bureau of the Government of the Hong Kong Special Administrative Region of the People's Republic of China under the Quality Enhancement Grant Scheme.

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Hybrid Learning Trends in Continuing Education for Working Professionals

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Abstract. Working professionals today are faced with unprecedented challenge of keeping pace with rapidly changing work environment in a globalized world. Corporations employing these professionals are aware of this challenge and therefore, are increasingly deploying hybrid learning solutions to cater to the continuing education needs of their employees. The hybrid learning option allows them cost optimization in today's times of global recession, while providing opportunities of customization as per their unique training and development goals. This paper highlights the latest trends suggesting an increasing propensity of corporations to engage service providers in creating customized hybrid learning solutions as against off-the-shelf purely face-to-face (F2F) or purely online learning solutions. By considering the case of a service provider located in South East Asia catering to corporations world-wide, the paper suggests a middle course that is conducive to client corporations as well as service providers in achieving the learning outcomes at an economical cost.

Keywords: Hybrid Learning, Continuing Education, Working Professionals.

1 Introduction

Globalization has brought about several changes to the way business is done the world over. Corporations today are facing cut-throat competition from domestic as well as multi-national players. Rapidly changing customer preferences, shrinking product life cycles, and reducing margins are compelling these corporations to be flexible enough to face the competition effectively. Naturally, this requires continual augmentation of knowledge and skill-set of employees while making them comfortable to the realities of frequent changes in business processes for continuous improvement. The employees themselves are aware of the imperative of professional growth and therefore, keep exploring new avenues of continuing education (CE). Executive CE encompasses the repertoire of formal and informal interventions aimed at broadening or enhancing the mindset, knowledge, skills, experience, competencies and capabilities of working professionals [1].

Conventional brick-n-mortar universities have traditionally acted as service providers for corporations in addressing the CE needs of their employees. Such universities compete with other universities in the region where a corporation is

S.K.S. Cheung et al. (Eds.): ICHL 2013, LNCS 8038, pp. 401–410, 2013.

located in order to garner their share of continuing education service provision opportunity. Some universities do not hesitate to go out of their way to placate potential client organizations. University of Indianapolis, for example, created an executive MBA program for the executives of one of the world's largest aircraft engine manufacturer by using case studies and assignments specific to their industry and by delivering the program at the company premises as per their customized schedule [2]. Similarly, Nanyang Technological University in Singapore specifically created a one-year full-time residential Executive Master of Public Administration program for Chinese administrators having significant professional experience, and who prefer more realistic entrance requirements compared to the home-grown MPA programs [3].

With an increasingly mobile and geographically distributed workforce, a natural step for many corporations is to move away from traditional location-centric face-to-face learning to a borderless online learning mode which, for many, has proven to be a more effective solution. "Just-in-time education" or "Continuing education on demand" approach is increasingly becoming imperative for organizations to keep pace with rapidly changing technology [4]. This also satisfies the basic requirement of life-long learning that the working professionals can learn at their own convenience [5].

Blending F2F with online learning in creating hybrid CE programs bring in the best of "both worlds". Hybrid learning model has been found to be more effective than a traditional classroom format for working adults [6]. The significance of F2F instruction in hybrid CE programs in increasing their effectiveness has been highlighted in earlier contributions by the author [7]. The integration of social F2F instructional events in a blended professional development program were deemed extremely effective by participants in breaking down barriers and establishing network of contacts, which later helped in collaborative learning during the online component of the program [8]. It has also been reported that continuing engineering education becomes more effective when online content covering fundamentals is added as a pre-requisite for the F2F intervention [9]. Hybrid CE learning is increasingly becoming popular in workplaces in the USA [10], however it is still in its infancy in rest of the world.

This paper outlines the journey of GlobalNxt University in creating several online/ hybrid learning programs in CE for working professionals across the globe. Established in 2012 in Kuala Lumpur (Malaysia), GlobalNxt has its lineage from U21Global Graduate School in Singapore, which imparted CE to about 9000 working professionals from 72 countries during the last one decade of its existence. Transcending geographical boundaries, GlobalNxt provides cutting-edge learning solutions to corporations in different industries, service as well as manufacturing. Blending of F2F as well as synchronous delivery tools like WebEx, Interwise, Elluminate, etc. with an asynchronous Learning Management System (LMS) has been successfully done in varying proportions in its hybrid CE programs [11].

2 Continuing Education for Working Professionals

Continuing education has traditionally been imparted by corporations to its executives in F2F settings, whereby the faculty resources are either drawn from within the organization (in-house experts) or faculty from conventional brick-n-mortar universities/ institutions are engaged. In some instances, private consultants in their own capacity are hired for delivering specific programs. Several big corporations have established their own corporate universities to cater to the huge volumes of CE needs of the organization. The best known example of a corporate university is Motorola University (now integrated into Motorola Solutions Learning) [12], which provides hands-on training to professionals in Six Sigma quality.

Working professionals require continuing education for one or more of the following reasons:

- To acquire higher qualification that may entitle them to apply for better jobs or gain promotion in their existing organization
- To update skills and knowledge to help them perform their jobs in a better way in their functional domains
- To gain expertize in new emerging fields in order to diversify their career into areas offering better growth prospects as a professional

Organizations impart continuing education to their employees for the below reasons:

- To build confidence in their employees that the organization "cares for them" and would like to ensure their professional growth
- To impart training in functional domains for enhancing productivity, safety and quality
- To groom their engineering staff for managerial positions that entails imparting management development training
- To create a leadership pipeline by making the middle management executives undergo leadership development programs
- To enroll employees into long-duration hybrid/ online/ part-time F2F degree programs to serve as an employee retention tool

2.1 GlobalNxt University

GlobalNxt University is a pioneering academic institution that delivers degree programs through a unique online global classroom pedagogy. Bringing together over 75 distinguished faculty from across 17 countries and meticulously developed content, GlobalNxt sets a new quality standard for online education. Through a state-of-the-art online learning platform, the university offers students highly interactive learning at any time, and from anywhere. GlobalNxt is fully committed to providing student-centric lifelong learning that delivers meaningful and relevant educational outcomes. The university's globally diverse student population is represented by over 72 different countries. In addition, through close industry partnerships, the university has talent development programs with over 100 multinational companies.

The university's unique academic heritage and experience in online education is founded on U21Global, an online education initiative originally pioneered by a group of 21 international universities [13].

2.2 Current Trends in Continuing Education

Typically, the clients of GlobalNxt are large corporations having a workforce scattered nationally or internationally. Bringing their executives to a single location for imparting conventional F2F training involves considerable travel, lodging, boarding and miscellaneous costs, while incurring the loss of productivity for the number of days the executives are away from their responsibilities. At that, F2F sessions are generally faculty-centric and do not allow for major involvement of participants in creating new knowledge or sharing tacit knowledge acquired by virtue of unique experiences in the workplace. By including the online component in hybrid programs, opportunities for inclusion of participants in creating a learner-centric environment are much enhanced. The use of webinars for reducing the number of F2F sessions, especially for faculty located in far-off international locations, is another effective way used by GlobalNxt for blending its hybrid CE programs.

Table 1. GlobalNxt CE programs plotted against the extent of customization and time duration

Extent of Customization	Less than 6 Months	Between 6 to 9 Months	More than 9 Months
High	Shangri-La Hotels L H Martin Institute BHP Billiton	IOCL CGBL Virtusa CGBL Steria CGBL	Avantha Group CGBL
Medium	Tata Chemicals IOCL Project Mgt. Mahindra & Mahindra Murugappa Hero Honda Tata Motors	Quest-Global CGBL	Lakshmi Machine Works
Low	L&T Infotech IOCL Finance for NF Tata Consultancy Services Vedanta	Patni Computer Services	Aditya Birla MBA IBM MBA/ MMIT Intel Corp. MBA/ MMIT

Time Duration

As is evident from Table 1, GlobalNxt created all sorts of hybrid CE programs with low, medium and high level of customization with their total time duration ranging from less than 6 months, between 6 to 9 months, and more than 9 months. Programs with low level of customization are either single subject Professional Development Awards (PDAs) with typically about 3 months duration (out of the MBA portfolio courses) or Diploma (combining 3 subjects), MBA (Master of Business Administration), MSc in IT Management, etc. Corporate clients use the PDAs for honing knowledge and skills of their executives in specific functional areas, while enrollment into longer-duration standard Diploma, MBA or MSc. in IT Management as retention tools to extrapolate the stint of the executives with the organization. GlobalNxt allows progression of executives completing several PDAs into a diploma award, followed by completion of further courses leading to the award of MBA/ MSc. in IT Management degrees.

In low level of customization, the faculty is informed about the inclusion of a few participants from a particular corporate client in the program and it is left to the faculty to decide about the case studies, discussion board topics, team assignments, final project and the final exam to be used while considering the overall composition of the class (industry background of students). The assessment strategy remains same as in standard graduate programs.

The medium-level of customization in these programs is limited to choice of industry-related case studies, discussion board/ assignment topics, and specific topics to be covered in the F2F component of the hybrid CE programs. This is subject to the condition that the corporate client provides a full cohort of executives (at least 20 in number). The assessment strategy can be tweaked up to some extent.

A high level of customization includes the choice of topics in the online content and F2F over and above the medium level of customization category. This level also allows for incorporating relevant articles from the e-library to top-up the online content as per the unique requirements of the client. Typically, the program falling in this category is the Certificate in Global Business Leadership (CGBL) comprising of about 6-10 modules covering 6-12 months duration. The assessment strategy is designed as per the unique learning outcomes to be achieved by the corporate client.

Naturally, the high level of customization consumes huge resources at GlobalNxt as well as the client organizations, leading to high overall cost of hybrid programs. In this level of customization, GlobalNxt used to allow the client organization to have a full view of all the online content in its graduate programs and thus, allowing them to choose the topics of content relevant to them. Over the years, certain trends were observed on the choice of topics typically made by client organizations to develop

Table 2. The Executive Campus Suite at GlobalNxt University

Managing Mindset	Leadership Essentials	Management Problem Solving	Management Consulting	Strategic Management	Knowledge Management	Creative Thinking
Managing People	Managing Groups	Human Resource Management	Business Communication	Managing Performance	Managing Innovation	Coaching
Managing Process	Total Quality Management	Project Management	Operations Management	Services Management	Supply Chain Management	Managing Change
Managing Customers	Marketing Management	Customer Relationship Management	Strategic Account Management	Sales Management	Negotiation	Retail Management
Managing Organization	Global & Regional Economics	Entrepreneurship	Corporate Social Responsibility	Finance Essentials	Financial Budgeting	International Business

certain competencies in their executives like managing mindset, managing people, managing process, managing customers, and managing organization. Hence, during early 2012, an Executive Campus (EC) Suite of modules was developed that considerably reduced the effort involved in customization (Table 2). Various modules in each row of the EC matrix help in achieving a particular competency.

Table 3. Mapping performance and learning outcomes with relevant EC modules

Performance Outcomes	Learning Outcomes	Suggested EC Module(s)
- Will be able to give feedback to direct reports and receive feedback from supervisors and peers - Communicate in a clear, articulate way to influence the team	- Give and receive feedback to teams - Principles and skills for influencing the team and peers	- Business Communication
- Communicates intentions, ideas and feelings assertively and effectively with team and peers - Will be able to reduce rework arising out of miscommunication within the team	- Understand the need to be assertive to be an effective leader - Listening with intent	
- Adapts to the communication styles of the team members	- Understanding of the Communication Styles of the team and hence communicating with team members	
- Will be able to manage multiple stakeholders like team or peers - Will manage conflict discussions constructively within the team	- Understanding Stakeholder management - Problem Solving and decision making - To understand conflict management skills for successful leadership	- Managing Groups - Problem Solving
- Identify the styles of the team and adapt to their styles accordingly - Will be able to help up-skill the team	- Understand the various styles of leadership and their usage - Understand the competency and capability of the team	- Leadership Essentials
- Will be able to delegate to save time, develop people and identify successor within the team	- Able to match the skill set and job description Identify - whom to delegate - what to delegate - how to delegate - when to delegate	
- Identify the motivation levels and needs of the team	- Understand the levels of motivational needs through the need hierarchy framework - Apply the needs framework to the team members	
- Exhibit high drive for results/deliverables in the team/project	- Understand the behaviors and tools that drives leads towards results - Understand how to coach for achieving results	- Coaching

Table 3 shows a typical example of the performance and learning outcomes desired by a corporate client for a proposed hybrid CE program and the corresponding mapping of modules done by the GlobalNxt team from its EC Suite. Outcomes that remain unaddressed through the module content are covered by including supplementary articles from the e-library.

The EC 'mass customization' approach has recently resulted in GlobalNxt creating the CGBL program for Quest-Global at much less effort (and pricing) compared to Avantha CGBL, while achieving greater client satisfaction.

2.3 Customization Imperative for Hybrid Programs

A big advantage of distance/ online component in hybrid continuing education programs is that the learning materials can be customized to individual learner needs through the use of technology [14]. Organizations creating hybrid CE programs for their employees increasingly prefer customized solutions rather than off-the-shelf programs from service providers. This is so because organizations want to provide authentic learning experience to their employees such that they may relate the concepts covered in a corporate training program with their actual work scenarios. In a hybrid CE program, the first stage of customization involves liaison with the company learning and development (L&D) team to understand the learning outcomes of the CE program.

Fig. 1 gives a generic model of customization of a corporate CE program including the various personnel involved both from the client side as well as the service provider side.

From the client side, usually a member of the L&D team serves as the client contact person. This person takes inputs from various business stakeholders including the employees, top management, vendors and sub-contractors for understanding the strategic business goals, competency-building requirements and subsequently, may take their help in program design. The role of this contact person is to translate the strategic business goals of the company into corporate learning goals and share them with the service provider organization. This client contact remains in constant touch

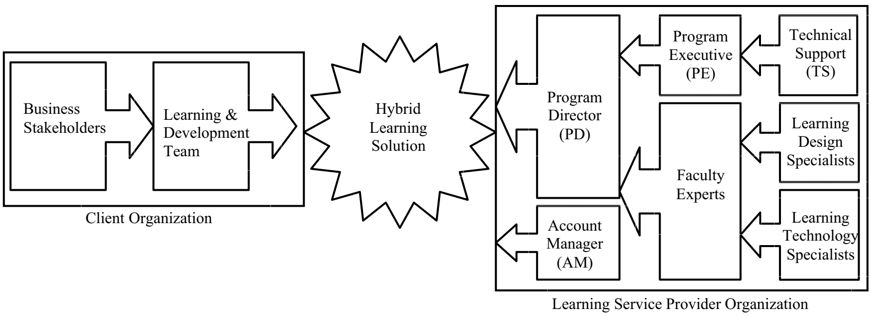

Fig. 1. A generic model of customization of a corporate CE program

with the Program Director (PD) and the Account Manager (AM) from the service provider throughout the design, development and delivery of a hybrid CE program.

The AM is a sales person from the service provider side, whose role is to reach out to the client to explore potential business opportunities of creating hybrid CE solutions. Typically, the AM meets with the L&D team of the client with a portfolio of off-the-shelf as well as customized hybrid CE solutions. Once a business relationship is established with a client, the AM has to manage that relationship in order to sustain it for a long period of time with a regular stream of business coming from the client both in terms of creation of new CE programs as well as extending new cycles of the existing programs. During the initial few meetings with the client, if there is interest shown for customized hybrid CE solutions, the AM invites the PD to join for subsequent meetings with the client.

The Program Director (PD) is typically an academic himself/ herself, who is experienced in hybrid CE program design. During the initial few meetings, the PD explains the customization options and process to the client, including the intricacies of face-to-face (F2F) and online components. At the same time, the first-hand discussion with the client allows the PD to understand their corporate learning goals to be addressed through the customized CE program. The customization may involve finding industry-specific case studies (based upon the client organization, its competitors, vendors, customers, etc.), creating discussion board/ assignment/ project topics relevant to the client organization, and/ or authoring new F2F/ online content from scratch as per the unique requirements of the client. Here, the PD takes help from faculty colleagues (hailing from all over the globe in case of GlobalNxt) as well as the learning design and learning technology specialists in creating an optimal hybrid CE solution.

The PD also owns the delivery part of the hybrid CE program, with support from a dedicated program executive (PE), who acts as the first point of contact for the learners in case of any problem whatsoever. The PE escalates the issue faced by a learner to the technical support, concerned faculty, the e-librarian, or the PD, depending upon the nature of problem. In a hybrid CE program, this support is critical, particularly during its online component when the learners are geographically dispersed and need prompt help whenever required.

2.4 Creating Organization-Specific Case Studies Using the Wiki

According to Dewey, reflective thinking converts action that is merely appetitive, blind, and impulsive into intelligent action [15]. This is exactly the reason why GlobalNxt University strongly recommends inclusion of a Final Reflective Integrative Project to its clients at the end of a hybrid program. In this project, the participants are required to reflect upon – 'What has been learnt?', 'How can it be applied to work?', and 'How will it benefit the organization?'

In some instances, the client organization (like Indian Oil Corporation Limited – IOCL) insisted upon including case studies very specific to their industry (Oil, Gas, & Petrochemicals) in every module of the hybrid CE program. GlobalNxt could not find sufficient number of such cases in the best of case study databases. Therefore, in the first cohort of the IOCL Hybrid Program in Project Management, a Wiki tool (akin to Wikipedia on the Internet) was deployed in the LMS. In this exclusive space, participant teams were assigned with specific Wiki pages to share their real-life experiences of managing a particular project at IOCL. Thus, at the end of the first batch, ten such organization-specific case studies were created by the participants themselves by sharing their tacit knowledge of managing IOCL projects. Fig. 2 shows the sample screenshot of one such project.

The case studies thus created were shared with subsequent batches of the same program, in which participants were allowed to either add more experiences to existing case studies (authored by previous batches) or suggest another IOCL project not covered in the Wiki till that time. Thus, knowledge transfer through the Wiki happened not only within a particular cohort but also from one batch to another. At the end of the recently concluded seventh batch, about 70 odd case studies specific to IOCL context are ready in the LMS. Customization up to this granular extent has granted GlobalNxt a unique competitive advantage in hybrid CE space globally.

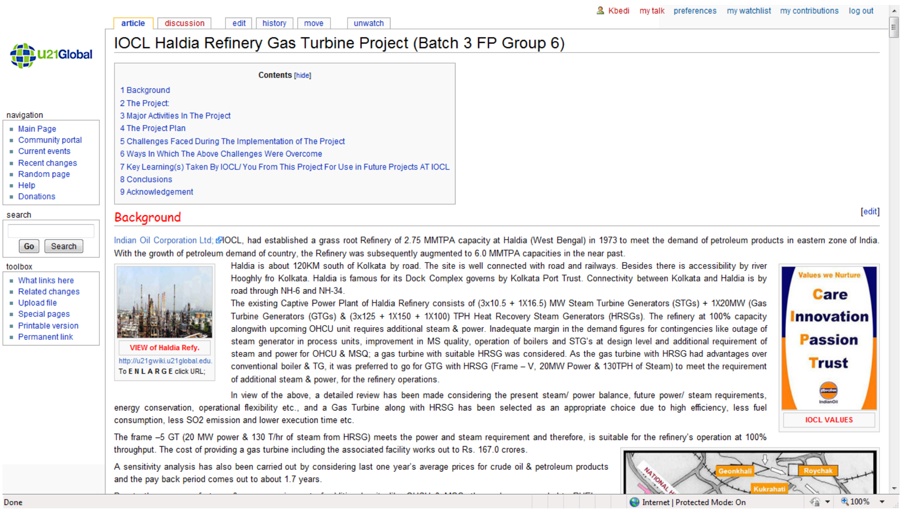

Fig. 2. Sample screenshot of a Wiki-page created in IOCL Hybrid CE Program

3 Conclusion

People are undoubtedly the most important asset in an organization. Investing in people development, through education and training, can reap substantial return-on-investment (ROI) through improved decision-making, productivity, collaboration and leadership. Few would doubt that there is a close correlation between the competitiveness of an organization and the quality of its workforce and leadership. Increasingly, organizations worldwide are recognizing the merits of hybrid CE programs for developing desired competencies in their employees. One such provider of customized hybrid CE solutions located in South East Asia is GlobalNxt University, which has designed its Executive Campus (EC) Suite on the principles of "mass customization" to help organizations in achieving their unique learning outcomes. It has taken customization of hybrid CE programs to the next higher level by harnessing the potential of the Wiki tool in creating organization-specific case studies, thus supporting client organizations in their knowledge management effort.

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