

Siu Cheung Kong · Tak Lam Wong
Min Yang · Cheuk Fai Chow
Ka Ho Tse *Editors*

Emerging Practices in Scholarship of Learning and Teaching in a Digital Era

 Springer

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Preface

The intended readers for this book are academics and leaders in higher education who care about student learning. With the fast expansion of higher education around the world, there is a pressing need to look into how to provide significant learning experiences for students and how student learning can be improved. The Scholarship of Learning and Teaching (SoLT), with a chief goal of improving student learning, provides a possible way for addressing this pressing need. The idea of SoLT originates from the classic book by Boyer (1990), who suggested that teaching in higher education should be regarded as a serious intellectual work similar to research. Researchers after Boyer have further elaborated and clarified the concept, no matter in the names of Scholarship of Teaching (SoT), Scholarship of Teaching and Learning (SoTL), or less frequently, SoLT, with a sharper emphasis on student learning.

In this book, we put forward a holistic conceptual framework for implementing SoLT in higher education. Unlike previous studies usually focusing on a specific aspect, we aim to integrate different aspects into a holistic framework, with three stakeholders identified, namely the higher education institution, teaching staff, and students. These stakeholders are connected by four interlocking themes: (1) staff professional development; (2) enhancement of student learning experience; (3) assessment; and (4) digital technology. This book aims to contribute to the advancement of SoLT in higher education in relation to existing theories and emerging practices. It contains three major sections, namely staff professional development, enhancement of student learning experience, and assessment, with chapters contributed by academic and teaching staff in higher education. Digital technology is a theme infused into all three sections. The chapters collected cover a whole range of subject areas and student learning outcomes. This book allows academics and leaders in higher education to implement SoLT for the improvement of student learning and teaching practices. It also contributes to the field of teacher education, as it systematically highlights the ways of building the capacity to teach. In addition to this holistic conceptual framework, a unique contribution of this book

is the theme of digital technology, which is less explored in the previous SoLT literature, and yet its importance in learning and teaching in higher education is increasingly recognized.

Tai Po, Hong Kong

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Chapter 1

Toward a Framework of Studying Scholarship of Learning and Teaching in Higher Education in a Digital Technology Era

Siu Cheung Kong, Ming Lai and Tak-Lam Wong

Abstract The Scholarship of Learning and Teaching (SoLT) has the chief goal of improving student learning, which can be achieved through scholarly inquiry, reflection, and dissemination of research findings on learning and teaching. The idea originates from the report written by Boyer (1990), who suggested that teaching in higher education should be regarded as a serious intellectual work similar to research. Researchers after Boyer have further elaborated and clarified the concept, no matter in the names of Scholarship of Teaching (SoT), Scholarship of Teaching and Learning (SoTL), or, less frequently, SoLT, with more emphasis on learning. The concept has been implemented in higher education institutions around the world, and there are research reports exploring the different aspects related to its implementation. In this chapter, building on previous models of SoLT as well as empirical studies, we put forward a holistic conceptual framework that takes into consideration the higher education institution, teaching staff and students altogether. Our framework highlights four important themes: (1) staff professional development; (2) enhanced student learning experience; (3) assessment; and (4) digital technology. Digital technology is especially a theme less studied in the literature on SoLT, but should be included in the framework of SoLT in a digital technology era.

Keywords Scholarship of Learning and Teaching · Scholarship of Teaching and Learning · Higher education · Professional development · Enhanced student learning experience · Assessment · Digital technology · SoLT · SoTL

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1.1 Introduction

In 1990, the former president of the Carnegie Foundation for the Advancement of Teaching, Ernest Boyer, published a report titled *Scholarship reconsidered*, arguing that the scholarship in higher education should not be solely defined by research achievement, but consists of four interrelated elements: discovery, integration, application, and teaching (Boyer, 1990). The scholarship of discovery is similar to the view of making knowledge contribution by conducting research. The scholarship of integration requires a scholar to make connections within and between the disciplines, and to situate the specialized knowledge in a bigger context. The scholarship of application is defined by applying knowledge to solve social problems and to contribute to the general public. Finally, the scholarship of teaching, based on the view that the work of an academic can have an impact only if it is understood by other people such as students, emphasizes teaching not as a routine function that any person can do, but “the highest form of understanding” as articulated by Aristotle. Boyer’s (1990) ideas provide a new way of viewing academic work (Hutchings, Huber, & Ciccone, 2011; Trigwell & Shale, 2004). By regarding teaching as a scholarly work that can be taken as seriously as research, his idea of Scholarship of Teaching (SoT), especially, has a long-lasting impact on the field of higher education around the world (Vardi, 2011).

1.2 Evolution of the Concept of the Scholarship of Teaching (and Learning)

Boyer (1990) highlighted the importance of teaching in higher education as it can be regarded as a serious intellectual work (Hutchings et al., 2011). However, he did not provide a clear definition of SoT, which was then criticized as an ambiguous concept (Boshier, 2009). As a result, researchers after Boyer (1990) have tried to elaborate and clarify the concept of SoT. After Boyer’s death in 1995, his colleagues and successors at the Carnegie Foundation, Hutchings and Shulman (1999), clarified that SoT is not equivalent to excellent teaching, as it “requires a kind of “going meta”, in which faculty systematically investigate questions related to student learning” (p. 13). The emphasis on student learning is particularly noticeable by the emergence of the term, the “Scholarship of Teaching and Learning” (SoTL), in more recent articles. In another report published by the Carnegie Foundation, Glassick, Huber, and Maeroff (1997) identified a total of six standards to assess any scholarly work, including SoT: (1) having clear goals, (2) having adequate preparation, (3) using appropriate methods, (4) producing significant results, (5) demonstrating effective presentation, and (6) involving reflective critique. Shulman (1998) further argued that for an activity to be considered as scholarship, it should satisfy three conditions, being “public, susceptible to critical review and evaluation, and accessible for exchange and use by other members of one’s

scholarly community” (p. 6), suggesting for the importance of dissemination and peer review.

While Hutchings and Shulman (1999) differentiated SoT(L) from excellent teaching, there are researchers regarding excellent teaching as an element of SoT(L). For example, Kreber and Cranton (2000) identified three perspectives of SoT: (1) faculty conducting research on how to teach their discipline and publish the results, (2) teaching excellence, and (3) a scholarly way of teaching by the use of educational theory and research in practice, and through reflection on theory and practice. However, in a later article, Kreber (2002) differentiated between the following: (1) teaching excellence, which is mainly based on the judgment of performance; (2) teaching expertise, which requires a continuous reinvestment of mental resources to improve the practice of teaching; and (3) the scholarship of teaching, which relies on advancing the knowledge of learning and teaching and making the knowledge public for peer review. Based on this differentiation, Kreber (2002) further argued that teaching excellence and the scholarship of teaching should be recognized and rewarded separately as both of them are important. A differentiation similar to Kreber’s (2002) is articulated in McKinney’s (2006) article, with the categorization of the following: (1) good teaching, as measured by student evaluations, peer observations or review, and portfolios, aiming at promoting student learning; (2) scholarly teaching, which relies on reflecting on teaching, discussing with colleagues about teaching, reading, and applying the learning and teaching literature, and developing expertise in the learning and teaching knowledge base; and (3) scholarship of teaching and learning, which requires systematic study of learning and teaching issues, and sharing the work publicly through presentations or publications so that it can be reviewed and built on by others.

The above review suggests that SoT(L) is conceptualized differently by different researchers. Huber and Hutchings (2005) proposed to regard SoT(L) as a “big tent... under which a wide range of work can thrive” (p. 4). Although there is not yet a unifying conceptualization of SoT(L) to comply with, it is now widely accepted that SoT(L) emphasizes the improvement in student learning, which can be achieved through reflection on and inquiry into classroom teaching and the impacts on student learning, and the findings and ideas should be made public (Vardi, 2011).

1.3 Models of Scholarship of Teaching (and Learning)

Since Boyer’s (1990) articulation of the concept of SoT in the USA, it has spread to other countries and been implemented in higher education institutions all around the world (Hutchings et al., 2011; Vardi, 2011). Several conceptual models of SoT and SoTL have been developed. Kreber and Cranton (2000) developed their model based on the importance of reflection in the development of SoT. First of all, they differentiated three types of reflection: (1) content (the what); (2) process (the how); and (3) premise (the why, or the rationale behind). These three types of reflection

can take place with respect to three domains of knowledge about teaching: (1) instructional knowledge (strategies used in teaching); (2) pedagogical knowledge (the understanding of student learning); and (3) curricular knowledge (the reasons of teaching in a certain way). As a result, a total of nine components (3 types of reflection \times 3 domains of knowledge) are included in Kreber and Cranton's (2000) model, each with its own indicators. For example, an indicator of content reflection on instructional knowledge is to discuss teaching materials with colleagues; an indicator of premise reflection on pedagogical knowledge is to write a critique on an article related to student learning in a discipline; an indicator of process reflection on curricular knowledge is to conduct a review on curriculum objectives and to compare them with current practices (Kreber & Cranton, 2000).

While the model put forward by Kreber and Cranton (2000) mainly focused on the role of reflection, based on the interviews with teaching staff, Trigwell, Martin, Benjamin, and Prosser (2000) developed a multi-dimensional model of SoT, which contains a total of four dimensions. Firstly, an "informed dimension" ranges from the use of informal learning and teaching theories to the design and implementation of action research. Secondly, a "reflection dimension" ranges from unfocused reflection or no reflection at all to reflection focused on certain learning and teaching issues. Thirdly, a "communication dimension" ranges from no communication at all to publishing the work in international journals. Finally, a "conception dimension" ranges from regarding teaching as teacher-focused to regarding it as student-focused (Trigwell et al., 2000). Their model suggests that in addition to reflection, there are other dimensions to consider in the conceptualization of SoT.

In another model developed by Trigwell and his colleague (Trigwell & Shale, 2004), scholarship is regarded as a kind of activity. They proposed a practice-oriented model with three interrelated components: (1) knowledge, (2) practice, and (3) outcome, with practice being the bridge between knowledge and outcome (Trigwell & Shale, 2004). The knowledge component contains teachers' disciplinary knowledge, knowledge of learning and teaching, and knowledge of the context. With this knowledge base, teachers can perform the act of teaching. The practice component contains elements of teaching, evaluation, reflection, communication, and learning. Finally, the outcome component contains the results of the collaborative efforts of teachers and students, with elements of student learning, documentation (artifacts of the act of teaching), teacher learning, and teacher satisfaction (Trigwell & Shale, 2004). They proposed the concept of "pedagogic resonance" to connect teachers' teaching with student learning and quoted a study by Weston and McAlpine (2002) in analyzing videotaped university teaching sessions, in which parallel transcripts of teachers' and students' reflections were analyzed to look for moments of synergy in reflection (Trigwell & Shale, 2004).

Shulman (2004) proposed four possible models for an institution to support the implementation of SoTL. The first model is termed "Teaching academy as an

interdisciplinary center,” which allows staff members with similar interests in learning and teaching to gather together to form a multi-disciplinary community. The second model is termed “Teaching academy as an aspect of graduate education,” which emphasizes the role of the graduate school, with the concept of SoTL embedded in the cultivation of doctoral students as scholars. The third model is termed “Teaching academy organized around technology,” which highlights the role of technology, as staff members increasingly adopt technology in their teaching, and technology allows teaching practice and resources to be made public easily through electronic means. The fourth model is termed “Distributed teaching academy,” which focuses on building the capacity in different quarters, so that local efforts can in turn support more central initiatives for the benefits of the whole institution (Shulman, 2004).

Benson and Brack (2009) developed a framework with five sources of knowledge that can contribute to the understanding of SoTL in higher education: (1) philosophical knowledge including values and epistemologies, (2) learning theories, (3) knowledge of the discipline, (4) teacher knowledge in higher education, and (5) teacher knowledge from other fields of education. Benson and Brack (2009) also related SoTL with e-learning, arguing that knowledge from e-learning belongs to the fifth source, “teacher knowledge from other fields of education,” which could contribute to the understanding of SoTL (Benson & Brack, 2009).

Each of these conceptual models could help to enrich the understanding of SoT(L). However, the above review also suggests that except the one proposed by Shulman (2004), the other models mainly focus on the teaching staff rather than the institution. We believe that for SoT(L) to be successfully implemented, the role of the institution, including the provision of professional development opportunities, has to be considered (see also Chalmers, 2011; Haigh, Gossman, & Jiao, 2011; Martensson, Roxa, & Olsson, 2011). Moreover, in Trigwell and Shale’s (2004) model, a connection is established between teachers and students through the practice component of the teachers, we believe that the connection could further be elaborated by taking into consideration the issues of assessment and the provision of enhanced learning experience (see also Dickson & Treml, 2013; Shreeve, 2011). Furthermore, Shulman (2004) and Benson and Brack (2009) both suggest that technology or e-learning could play a part in SoTL. We believe that the role played by technology could even be more significant in this digital technology era, in which the use of digital technology in higher education is getting more and more popular (Kreber & Kanuka, 2006; Laurillard, 2002). In the following sections, we will put forward our conceptual framework, with three stakeholders: (1) the institution, (2) teaching staff, and (3) students, connected by the themes of staff professional development, enhanced student learning experience, assessment, and digital technology. The term we selected for our framework is Scholarship of Learning and Teaching (SoLT), rather than the more commonly used, SoTL or SoT, as we want to further emphasize the part of learning, as explained in the next section.

1.4 From Scholarship of Teaching (and Learning) to Scholarship of Learning and Teaching

In the field of education, a paradigm shift is observed from the focus on teaching to learning in more recent years (Huba & Freed, 2000). The articulation of the term “Scholarship of Teaching and Learning” (SoTL) (Hutchings & Shulman, 1999) suggests an extended emphasis on student learning in addition to teaching. Empirical studies on student learning can be found in the latest SoTL literature (see, e.g., Perry & Smart, 2007). However, there is a concern that the research focus in SoTL is too much on formal classroom learning (Boshier & Huang, 2008; Wilcox & Lackeyram, 2009). In the past decades, the conceptualization of “learning” has been expanded beyond formal classroom learning to include ideas such as self-regulated learning, lifelong learning, all suggesting that learning can occur without teachers’ teaching. The latest development in digital technologies with their associated pedagogies, especially, allows student learning to be less dependent on teachers’ teaching. The “learning” part in SoTL is something that needs to be further explored and theorized. Boshier and Huang (2008) proposed the term “Scholarship of Learning and Teaching” (SoLT) to emphasize more on learning and that “there is more to learning than being an afterthought tagged on to teaching” (p. 654). In this book, the term SoLT is employed as we want to highlight learning. However, when referring to the previous literature, the terms Scholarship of Teaching (SoT) and Scholarship of Teaching and Learning (SoTL) may be used interchangeably.

1.5 Framework of Scholarship of Learning and Teaching (SoLT) in Higher Education

The successful implementation of SoLT in higher education requires the involvement of the institution, teaching staff, and students. The holistic conceptual framework we put forward involves all these three stakeholders, connected by four important themes identified in the literature: (1) staff professional development; (2) enhancement of student learning experience; (3) assessment; and (4) digital technology, as shown in Fig. 1.1. The three stakeholders in our framework are in the shape of an ellipse, while the four themes in the shape of a rectangle.

The details of each of the themes will be elaborated below. This section will present an overview. First of all, the higher education institution and teaching staff are connected through staff professional development. On the one hand, SoLT emphasizes the self-initiative of teaching staff to improve their teaching practice

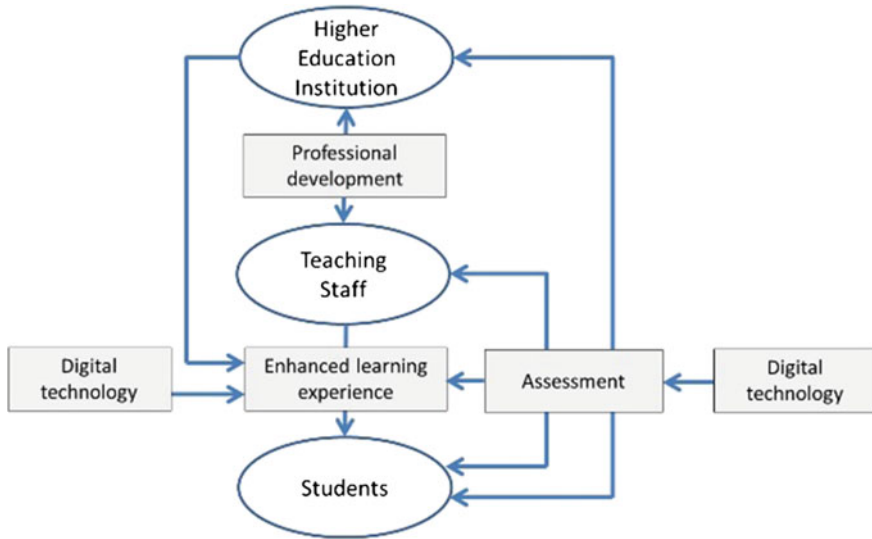


Fig. 1.1 A framework of the Scholarship of Learning and Teaching (SoLT) in higher education

(Adcroft & Lockwood, 2010); on the other hand, the institution can provide professional development opportunities for staff aiming to engage in SoLT (Martensson et al., 2011). Hence, the concept of staff professional development in SoLT should not be considered as either top-down or bottom-up, but the interaction of both (Adcroft & Lockwood, 2010). With the engagement in SoLT, teaching staff can provide enhanced learning experience for the students (Hutchings et al., 2011), as shown in Fig. 1.1. Teaching staff can draw on digital technology for the enhancement of student learning experience (Laurillard, 2002). In addition, at the level of the institution, students' learning experience can be enhanced by the provisions of internships, exchange programs, field experience, etc. The right-hand side of the framework is related to assessment. Two levels of assessment can be differentiated, one at the classroom level, between teaching staff and students, and the other at the institutional level. There is articulation for the strengthening of the connection between these two levels in the SoLT literature (Shreeve, 2011). Both levels of assessment can be used summatively as well as formatively, with the former indicating how well students are learning, and the latter for the improvement in student learning. When assessment is used formatively, that is, for the improvement in learning, it can contribute to the enhancement of student learning experience as well (Black, 2013). Finally, assessment can also draw on the latest digital technologies to provide alternative means of assessment, such as e-Portfolios, for the students (Stodberg, 2012). The literature related to these four themes will be reviewed in the following sections.

1.5.1 Theme 1: Staff Professional Development

SoLT, with its emphasis on building the capacity of faculty members in systematically inquiring into student learning and reflecting on their own teaching practice, can be regarded as a “powerful form of faculty development” (Hutchings et al., 2011, p. 12). In institutions around the world, centers for learning and teaching or educational development units have been set up to facilitate the professional development of teaching staff for the enhancement of student learning (Lewis, 2010). However, some teaching staff may think that professional development means such as teaching enhancement courses as unnecessary and as bureaucratic requirement on their time (Chalmers, 2011; Gibbs, 1989). In a review, O’Meara, Terosky, and Neumann (2008) differentiated two types of narratives on faculty research: “narrative of constraint” and “narrative of growth.” A “narrative of constraint” implies a deficit model of faculty, and development is something done to them by the institution. A shortcoming of such a narrative is that the motivation of faculty to thrive as professionals is obscured (O’Meara et al., 2008). In contrast, as noted by O’Meara et al. (2008), a “narrative of growth,” which emphasizes the agency and desire of faculty in their own professional development, has emerged in more recent studies. This “narrative of growth” is well aligned with SoLT, as both highlight the initiation of faculty for the improvement in teaching practice and student learning. As proposed by Hutchings et al. (2011), by taking a more active role in promoting SoLT, centers for learning and teaching can allow teaching staff to meet together to form communities within and across disciplines, help them find funding, support, and opportunities for dissemination of ideas and findings, and facilitate the alignment of growing needs of individual staff members and institutional agenda. All these are important elements for the professional development of teaching staff (Hutchings et al., 2011). In a recent survey conducted by the Carnegie Academy for the Scholarship of Teaching and Learning (CASTL) to investigate the impact of the SoLT initiatives on higher education institutions, “faculty development” was the most frequently mentioned impact at the departmental/program as well as institutional levels (Ciccone, Huber, Hutchings, & Cambridge, 2009).

In a study that explored the experience of staff engaging in SoLT activities, four conditions that could enhance staff’s engagement were identified, one of which being professional development opportunities, and the other three are issues related to time, collegial interaction and support, and a campus-wide culture shift for teaching staff to become investigators of their educational practice (Haigh et al., 2011). Professional development programs, including introductory ones for new staff and ongoing ones for existing staff, can facilitate the understanding and implementation of SoLT (Chalmers, 2011; Elton, 2009; Kreber, 2006). SoLT initiatives can also be used to reenergize senior staff members (Ochoa, 2012). The communities of practice (CoP) approach (Lave & Wenger, 1991), which is identified as an useful model for professional development (Borko, Jacobs, & Koeliner, 2010; Hadar & Brody, 2010), can help to lessen the feelings of isolation, stress, and marginalization of staff engaging in SoLT (McKinney & Cross, 2007). Hubball,

Clarke, and Poole (2010) identified CoP and faculty mentoring as two integral processes for enhancing SoLT. They found that through CoPs, strong connections between theory and practice can be created for staff members across disciplines and ranks (Hubball et al., 2010). On the other hand, mentors in SoLT can facilitate mentees' engagement in SoLT by modeling practice, stimulating and monitoring research activities, and enabling networking (Hubball et al., 2010). Martensson et al. (2011) identified a number of strategies for developing SoLT, including pedagogical courses, projects, departmental seminars, campus conferences on learning and teaching, and reward schemes. They highlighted the importance of leadership for the development of SoLT at the level of the institutional (Martensson et al., 2011). Moreover, the alignment of SoLT with institutional priorities (Schroeder, 2007) is important to address the challenge of implementing SoLT (Boshier, 2009). The provision of rewarding mechanisms for teaching, such as promotion opportunities, is also the concern of the latest SoLT literature (Chalmers, 2011; Cruz, Ellern, Ford, Moss, & White, 2009). More recently, there was also a call for action for Teacher(-led) Inquiry into Student Learning (TISL) in the field of technology-enhanced learning in Europe, in which the capacity building of teachers to investigate student learning and their teaching practice was identified as an important aspect of staff professional development (Mor, Ferguson, & Wasson, 2015).

1.5.2 Theme 2: Enhancement of Student Learning Experience

Staff members engaging in SoLT are more likely to adopt new classroom practices and approaches (Ciccone et al., 2009). Although SoLT is conceptually neutral toward any learning and teaching practice, as it mainly focuses on a systematic inquiry approach and the improvement in student learning, there is a tendency for staff engaging in SoLT toward pedagogical innovations, which often emphasize students' active roles in learning (Hutchings et al., 2011), which is in line with the multi-dimensional model proposed by Trigwell et al. (2000), as one of their dimensions highlights the shift from seeing teaching in a teacher-focused way to seeing it in a student-focused way. Therefore, SoLT can be considered as a catalyst for change (Hubball et al., 2010; Hutchings et al., 2011; Martensson et al., 2011). Some teaching staff may not be satisfied with the performance of their students, so they look for better ways for students to learn through engaging in SoLT (Adcroft & Lockwood, 2010). The professional communities formed by staff in SoLT, which may be organized by disciplines or by themes, allow staff members to share ideas and learn from one another, so that they have the opportunities to reflect on their own teaching practice and adopt innovative approaches (Cox, 2003; Hubball et al., 2010; Hutchings et al., 2011).

An important issue in higher education is to create significant learning experience for students (Fink, 2003). Staff members engaging in SoLT have an eager to

understand students' learning experience (Hutchings et al., 2011). In addition to disciplinary learning of students (e.g., Healey, 2000; Huber & Morreale, 2002), there is a call for a broader agenda, to include cross-disciplinary learning (McKinney, 2013) and to explore the diverse learning experiences of students, such as those related to self-management, learner autonomy, and social responsibility (Boshier & Huang, 2008; Kreber, 2005). In fact, when Boyer (1990) first introduced the idea of scholarship of teaching, he connected it with lifelong learning, as a teacher engaging in SoLT should "stimulate active, not passive, learning and encourage students to be critical, creative thinkers, with the capacity to go on learning after their college days are over" (p. 24). However, as Boshier and Huang (2008) argued that the "learning" part of the SoTL literature still too narrowly focuses on formal classroom learning. And as explained earlier, we intentionally employ the term "Scholarship of Learning and Teaching (SoLT) as we want to emphasize more on learning, which is in line with the current trend in the field of education (Huba & Freed, 2000). More research is needed to extend the conceptualization of learning in SoLT and to explore the relationship between SoLT and the development of students' self-regulated learning, higher-order thinking, and twenty-first-century skills.

1.5.3 Theme 3: Assessment

In the 1980s, the so-called assessment movement in higher education began in the USA, with the emphases on gathering data about student learning and public accountability (Huba & Freed, 2000). Both assessment and SoLT highlight the importance of student learning, being public about student learning outcomes and adopting a systematic and evidence-based inquiry on learning effectiveness (Dickson & Treml, 2013; Hutchings et al., 2011). However, unlike the engagement in SoLT which usually begins with staff members' concerns about matters related to their own classrooms, assessment is more likely driven by concerns about the effectiveness of an institution (Hutchings et al., 2011). Moreover, for assessment aiming at public accountability, there might be a tendency of presenting the better side of student learning (Ewell, 2009), while SoLT might focus more on areas of student learning in need of improvement (Hutchings et al., 2011).

With reference to the differentiation between formative (assessment for learning) and summative assessment (assessment of learning) (Black, 2013), SoLT is well aligned with the goal of formative assessment, as both focus on making use of assessment for the improvement in student learning. However, as SoLT commits to being public of how well students are learning (Hutchings et al., 2011), the summative aspect of assessment should also be taken into consideration in SoLT. Shreeve (2011) called for a closer connection between SoLT and institution research (IR), which aims at collecting large-scale data of student learning outcomes to inform management decision, as staff members engaging in SoLT have to evaluate their teaching practice and how well students are learning. Such a

connection involves scaling up from SoLT as well as scaling down from institution research, which is not an easy task (Hutchings et al., 2011). Shreeve (2011) argued for the importance of mediations, such as a group of locally based staff developers, that might connect the macro-level institutional research and the micro- or meso-level SoLT. The use of alternative forms of assessment in higher education, such as peer assessment and those involved digital technologies such as e-Portfolios (see e.g., Bryan & Clegg, 2006; Stodberg, 2012), could also contribute to the development and implementation of SoLT.

1.5.4 Theme 4: Digital Technology

The advances in digital technologies in the past years have changed the landscape of learning and teaching (Dede & Richards, 2012; Laurillard, 2002). As mentioned above, staff members engaging in SoLT are more likely to adopt pedagogical innovations in their classrooms (Hutchings et al., 2011). One important theme among these innovations is the use of digital technology (Ciccone et al., 2009). According to the survey conducted by CASTL mentioned above, technological innovations such as clickers and student e-Portfolios, are frequently used by staff engaging in SoLT (Ciccone et al., 2009). As the engagement in SoLT requires staff members to systematically inquire into student learning, digital tools, such as online survey, could also be used as the means to collect the data (Ciccone et al., 2009). Learning analytic is another area that digital technology can contribute to the inquiry into student learning, which can then feedback to the learning design (Mor et al., 2015). On the other hand, as SoLT requires staff to be public about their ideas and findings, digital tools, such as multimedia Web sites, teaching and course e-Portfolios, could be used as the means for disseminations (Shulman, 2004).

While technology can be regarded as a kind of tools used in learning and teaching activities, Oliver (2013) argued that there is a further need for the theorization of learning technology, especially on the social aspect, as technology is socially shaped and at the same time shapes the social. Networked technologies and Web2.0 tools such as Facebook are now shaping the interacting and living patterns of people, especially the younger generation. Moreover, the recent development in e-learning has emphasized students' social engagement, constructivism, learner control, and democratic values, which might help to extend the concept of SoLT, especially on the shift of focus from teachers to students (Benson & Brack, 2009). As envisioned by Shulman (2004), technology could be one of the driving forces for the enhancement of SoLT, as technology allows the sharing of teaching practice and resources, and faculty members are taking an inquiry approach to the use of technology in learning and teaching. Kreber and Kanuka (2006) further argued that SoLT and e-learning are mutually facilitative, as implementing e-learning often requires teachers to rethink their current practices, leading to a scholarly way of teaching, while engaging in SoLT requires teachers who implement e-learning to adopt a more systematic inquiry on the learning of their students. Hence, a closer

connection between digital technology and SoLT could result in a better theorization of learning technology on the one hand and an extended conceptualization of learning in SoLT on the other.

1.6 Chapters in This Book

Based on the above conceptual framework, we collect the chapters of this book under the four important themes identified. In preparing their chapters, the authors of each chapter were asked to respond to our major claims related to SoLT articulated in this introductory chapter. In responding to these claims, they may take them as reference points, targets, or challenges. For chapters under the theme of staff professional development, the claims can be summarized as follows:

- (1) The chief goal of SoLT is for the improvement in student learning;
- (2) The institution plays an important role in engaging staff in SoLT through providing professional development opportunities;
- (3) A staff professional development program in SoLT should enable staff to improve teaching practices and conduct inquiry on the improvement;
- (4) It is important to have opportunities to share the findings related to SoLT publicly and to apply the findings for the continual improvement in learning and teaching; and
- (5) Digital technology helps to broaden the conceptualization of learning and plays a significant role in enhancing students' learning experience and for conducting SoLT work.

For the remaining chapters, the authors were asked to respond to the following claims:

- (1) The chief goal of SoLT is for the improvement in student learning;
- (2) The institution plays an important role in creating significant learning experience for students;
- (3) More work is needed to broaden the conceptualization of learning in SoLT, which has focused too narrowly on formal classroom learning;
- (4) It is important to have opportunities to share the findings related to SoLT publicly and to apply the findings for the continual improvement in learning and teaching; and
- (5) Digital technology helps to broaden the conceptualization of learning and plays a significant role in enhancing students' learning experience and for conducting SoLT work.

Part I of this book has a focus on staff professional development. It has chapters covering the building of a mobile learning community for sharing good learning and teaching experiences; the experience of designing digital lectures for engaging the digital generation in teacher education; the implementation of a model of

professional development for the effective integration of educational technology; the duality of participation and reification in cultivating communities of practice (CoP) for leveraging knowledge for organizational development; and the lessons learnt in adopting a Bring Your Own Device (BYOD) initiative for students' reflective engagement at a higher education institution.

Part 2 of this book, with a focus on the enhancement of student learning experience, contains chapters on improving students' knowledge, attitudes, and behaviors related to plastic waste education; the use of an interactive conceptual approach to enhance the learning and teaching of green technology; the field-based unconventional learning experience of students to becoming a courier of Marine Stewardship; the development of students' self-awareness through service learning; the learning and teaching of creative writing integrated with literacy criticism; and the use of new media for learners of Chinese as a second language to learn vocabulary autonomously. Besides, Part 2 has two chapters on scholarship of teaching, with one proposing that extracurricular reading could facilitate students' appreciation of literature and writing skills and another on facilitating the formation of student's coherent concept image in mathematics via guided reinvention.

Part 3 of this book, with a focus on assessment, starts with a chapter which provides a detailed review on formative assessment theories and exemplary practices in a classroom setting. Empirical studies related to assessment are presented in subsequent chapters, including the impact of formative assessment on students' motivation and positive affect; the use of ICT to facilitate instant and asynchronous feedback for students' active learning; the use of feedback strategies to support students' critical thinking; the use of formative feedback to support students' professional learning; and the implementation of the assessment of generic attributes of students through the use of survey and e-Portfolios at an institution. As the theme of digital technology is widespread in chapters on staff professional development, enhancement of student learning experience, and assessment, there is no separate part containing chapters on digital technology.

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Part I
Staff Professional Development

Chapter 2

Community of Practice: Building a Mobile Learning Community in a Higher Education Institution to Promote Effective Teaching and Learning

Lixun Wang and Qing Ma

Abstract With the fast development of mobile technologies, mobile learning has been adopted by more and more students and staff in higher education institutions. However, most students and staff tend to explore mobile learning as individuals, and there is a lack of systematic exchange of ideas and strategies related to mobile learning among them. This chapter reports on a project on building a mobile learning community (MLC) to promote mobile learning in a Hong Kong tertiary institution. The research questions are as follows: ‘What are the key factors in building a successful mobile learning community?’ and ‘How can the effectiveness of the MLC be evaluated?’ The key factors identified in building a successful mobile learning community are recruitment of community members, establishment of a mobile learning community website as a platform for exchange of ideas, organization of sharing seminars/workshops, making an impact on students’ learning and on staff development. The evaluation of the effectiveness of the mobile learning community will also be deliberated. It is hoped that this chapter can provide some practical guidance and useful references for those who wish to establish a mobile learning community in their institutions in order to promote Scholarship of Learning & Teaching (SoLT).

Keywords Mobile learning · Community of practice · Higher education

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2.1 Introduction

In recent years, the fast development of mobile technologies (e.g., smartphones, tablets, and apps) has greatly enriched and assisted students' subject learning in higher education. In Hong Kong, the situation is even more favorable, as people can get relatively cheap data packages for smartphones with Internet access, and there is free Wi-fi service in many public places. In higher education, through mobile technologies, students can learn anytime, anywhere (Chan et al., 2006; Wong & Looi, 2011). They help to connect students' in-class and out-of-class learning experience (Lai & Gu, 2011), which helps to contextualize the learning and facilitate students' academic success (Kukulkska-Hulme et al., 2011). It is reported in Wu et al. (2012) that mobile technologies have been widely implemented in teaching and learning diverse subjects at different education levels in recent years.

As English is the major medium of instruction in Hong Kong tertiary education, this study links mobile technologies with subject learning through English and showcases the vitality and creativity of tertiary students of different levels (undergraduates, masters, doctorates) and from different disciplines (science, social science, education, arts, and humanities) in mobile learning. A broad definition of mobile technologies will be adopted in this study: various mobile devices (smartphones, mobile phones, netbooks, laptops, iPads, Tablet PCs, MP3s/MP4s, etc.) connected to a network and equipped with online technologies (Ma, in press).

According to Wenger (2010), Community of Practice (CoP) refers to a group of people who share a concern or passion for something they do and learn how to do it better as they interact with each other regularly. The concept of CoP is built on Lave and Wenger's (1991) earlier work that draws on adult learning theories; for most people, learning takes place in a certain context where they interact with and learn from partners rather than in a traditional classroom where there is a clear student-teacher divide. The principle characteristics of a CoP are as follows: *a shared domain of interest (the domain)*; *engagement in mutual learning and knowledge sharing (the community)*; and *shared inventory of resources (information for the practice)*. As a fairly new learning theory, such CoP practices have been carried out in various sectors, including education, business, and sciences. Traditionally, these CoPs refer to naturally occurring phenomena as originally expounded by Lave and Wenger (1991). In recent years, there are gradually more studies where the CoPs are predesigned or organized to achieve some specific goals (Fung, Boushey, & Morash, 2014; Kothari, Boyko, Conklin, Stolee, & Sibbald, 2015) largely in the fields of health care. However, such predesigned CoPs with clear organization features are rarely reported in education, especially higher education settings where students and staff need to learn from their peers or colleagues, respectively.

As we can see, CoP practices match well a social constructivist approach in which learning is regarded as an ongoing process where learners make sense of existing knowledge and construct new knowledge via sharing, conversation, and negotiation within a supportive community (Naismith, Lonsdale, Vavoula,

& Sharples, 2004; Sharples, Taylor, & Vavoula, 2007). Naismith et al. (2004, p. 15) noted that learners can be “connected to a shared data network, further enhancing possibilities for communication. These devices are also used in a group setting, and so interactions and collaboration will tend to take place not just through the devices but also at and around them as well.” In fact, network technologies have long been considered an important means in facilitating practices and sharing among CoPs (Johnson, 2001; Hoadley, 2012). Nowadays, the advent of the current mobile learning age greatly facilitates the formation of various online learning communities assisted by various ubiquitous and free mobile communication technologies and tools, e.g., Skype, Facebook, Line, WhatsApp, WeChat, and Google+. However, very few mobile learning activities designed by teachers or researchers support such learner-centered communication and collaboration (Kukulska-Hulme & Shield, 2008). Alternatively, there are reports only limited to some small technology-supported learner communities formed based on certain courses (e.g., Abdullah, Hussin, & Zakaria, 2013; Wang, 2014). These small learner communities are often temporary and of short duration, diminishing soon after the completion of the courses. Although it is a popular idea to view technology as an indispensable tool in supporting the practices of many CoPs, there is a dearth of studies where mobile technologies are seen as the core of the practices.

The current study reports how a predesigned large learning community was established within a higher institution where learners from diverse disciplines contribute, share information and resources, and learn together with the help of mobile technologies, which is not only seen as facilitating members’ practices and communication but also playing a central role in advancing their learning. In order to shed light on future CoP research and share practical knowledge and skills with other learner community builders, this exploratory research strives to answer the following research questions:

1. What are the key factors in building a successful mobile learning community (MLC)?
2. How can the effectiveness of the MLC be evaluated?

As mentioned in Chap. 1, the Scholarship of Learning and Teaching (SoLT) has the chief goal of improving student learning. As one of the SoLT initiatives, the MLC aims to enable staff to change teaching practice and perform inquiry on the change, with the ultimate goal of improving student learning.

2.2 Research Design

Multiple methods were used in this exploratory study: survey, interviews, and document analysis. First, a project team was formed with expertise in mobile learning in different disciplines (language, linguistics, information technology, mathematics, education, etc.). Then, the project team met regularly (face-to-face or

via communication technologies) to understand information, acquire knowledge, develop instruments, and find solutions to emerging problems while building and researching into this MLC. The whole project was carried out in three phases:

2.2.1 Phase I: Literature Review, Team Meetings, and Investigating Potential Members

After a thorough review of the literature on community of practice and mobile learning, the research team identified and discussed a number of key issues and themes to be explored in this research. A systematic inquiry has been formulated via a series of project meetings. In order to learn about students' experiences and perceptions on mobile learning, a questionnaire survey was developed and piloted with a small number of participants. The finalized questionnaire was then sent out randomly to students from the Education University of Hong Kong (EdUHK) with 227 valid ones returned. Following the survey, 20 students were interviewed to obtain in-depth information regarding their mobile learning practices and preferences. Surveying and interviewing potential members provided the project team with valuable information in (1) their learning interest, (2) favoured learning activities, and (3) preferred learning resources. Such information was carefully considered in the next steps of building the MLC.

2.2.2 Phase II: Building the MLC Platform and Promoting the MLC

Through the literature review, team discussions, survey and interview results, a rich collection of student mobile learning practices was obtained, such as their favorite mobile devices for learning purposes, frequently accessed online learning resources, various learning apps and tools, strategies for self-regulating their mobile learning, and perceived difficulties associated with mobile learning. Based on such rich information, a mobile learning community (MLC) website was developed to host and share diverse mobile learning information and resources contributed directly by students. This website serves as the main platform to disseminate mobile learning information and, more importantly, attract and recruit MLC members. Two membership registration forms (for students and staff, respectively) were developed and hosted on the website in order to recruit more members. To further disseminate project outputs, a series of knowledge sharing sessions in the form of seminars/workshops on mobile learning given by students and staff were organized. Such meaningful and interactive sharings form the main learning activities for community members.

All MLC activities, literature review, project team meetings, survey and interviews, student and staff sharing, member reflections and online events via the MLC website, conducted in Phases I and II, were documented and analyzed in order to answer the first research question, i.e., What are the key factors in building a successful mobile learning community (MLC)? The data were mainly analyzed qualitatively in terms of coding and looking for patterns and themes.

2.2.3 Phase III: Evaluating the Effectiveness of the MLC

To evaluate the effectiveness of the mobile learning community, several sets of assessment tools were developed: (1) a questionnaire to collect participants' views on the various community activities organized by the MLC, i.e., various sharing sessions/seminars/workshops on mobile learning; (2) an online survey form to collect users' views on the MLC website; (3) evaluation of members' achievements, and (4) an evaluation form for evaluating the overall effectiveness of the MLC, which were completed by two invited experts in the field of mobile learning. All four types of data will be analyzed to answer the second research question, i.e., How can the effectiveness of the MLC be evaluated?

2.3 Findings and Discussion

Based on the literature review, the results of the survey and interviews regarding students' experiences and perceptions on mobile learning, and the views and comments collected about various community activities, the following key factors for establishing a mobile learning community were identified, and various strategies were adopted by the project team to address these key factors when forming a mobile learning community.

2.3.1 Key Factors in Establishing a Successful Mobile Learning Community

2.3.1.1 Strategic Recruitment of Community Members

Creating a critical mass is considered to be the first step of establishing a community of practice. This critical mass will take the leading role to organize various events and develop useful resources to promote mobile learning, so that the community will expand and grow healthily. As a result, in the initial stage of the project, six staff members at EdUHK who had been using mobile technologies proactively

in their teaching were identified, and a project team was formed. The project team members then identified around 30 students who were proactively engaged in mobile learning and recruited them to join the mobile learning community. From October 2013 to June 2015, in order to attract new members to join the MLC community, the core project team members organized numerous events and activities related to mobile learning, and by July 2015, 64 staff and 252 students had registered as members of the MLC. Only through all these active members could the mobile learning community play a significant role in promoting mobile learning at EdUHK. With continuous effort, it is expected that more and more staff and students would join the community.

2.3.1.2 Creating a Rich Information Sharing Centre: Building a Mobile Learning Community Website

Based on the surveys and interviews, students wished that valuable mobile learning resources and successful mobile learning experiences by students and staff could be shared through an MLC website, so that community members could exchange ideas via this online platform. After sustained effort, in August 2014, a mobile learning community (MLC) website (<http://corpus.ied.edu.hk/mlc>) was established and launched. This online platform allows community members (students and teachers) to share their valuable insights and to disseminate good practices to other students and teachers who are interested in mobile learning. Again, after studying survey and interview results, it was decided that the website would feature the following sections: Activities, Listen & Read, Watch, App Reviews, Recommended Apps/Websites, M-Learning Guide, and Others (see Fig. 2.1).

MLC Home page

The MLC home page features an introduction that informs the visitors of the different resources available on the site. Visitors can also click on the “membership” hyperlinks (for students or teachers) to fill in the membership form and become a member of the MLC, and they can fill in an evaluation form as well to evaluate the MLC website. Latest news and events of the MLC are also announced on the home page in the format of an animated scrollbar. Quick Links are provided as well so that members can get access to various sections of the website easily.

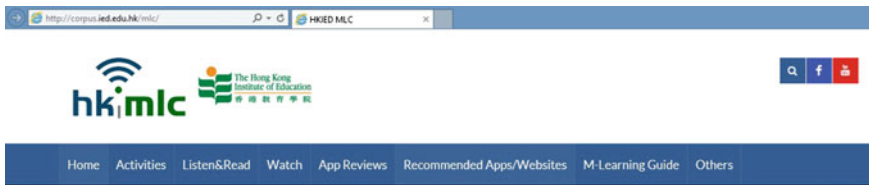


Fig. 2.1 Menu bar of the MLC website

Activities

The activities section contains detailed descriptions and posters about present and past community activities, such as seminars, sharing sessions, mini conferences, workshops, and competitions related to the topic of mobile learning. If members missed certain community activities, such as a seminar on mobile learning, they can go to the past community activities page and get access to relevant information related to that activity (seminar or workshop).

Listen & Read

The "Listen & Read" section features personalized mobile learning stories written by academic teaching staff from different departments (e.g., mathematics and information technology, linguistics and modern language studies, and health and physical education) and students at EdUHK from different majors (e.g., social science and language studies). These personalized learning or teaching stories document students' and teachers' innovative use of mobile apps or Web technologies in facilitating their learning and teaching. Audio clips of students describing their mobile learning experiences are also included. Figure 2.2 shows a mobile learning story shared by a student.

Watch

The "Watch" section hosts a series of videos featuring students' personalized experience in using mobile apps to facilitate their learning, and academic staff's

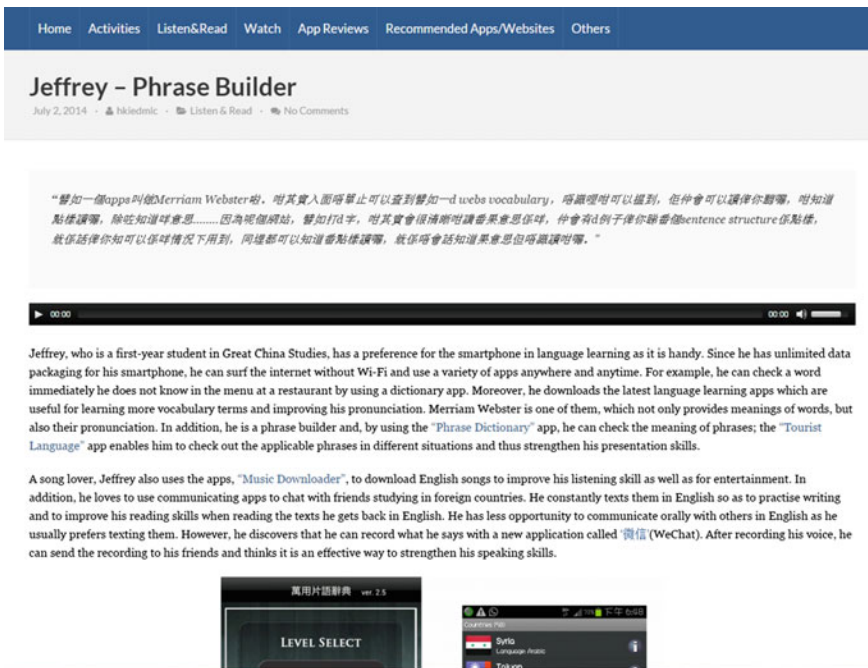


Fig. 2.2 Personalized mobile learning story shared by a student

experience in adopting mobile technologies or apps to facilitate their teaching (see Fig. 2.3). As students and staff might not be able to attend these sharing sessions due to time conflicts or other constraints, making video clips available online provides opportunities to all community members to learn and benefit from these valuable sharing sessions.

App Reviews

The “App Reviews” section features almost two hundred language and subject learning app reviews contributed by proficient English learners of different majors from more than 13 Hong Kong higher education institutions/universities. The student reviewers who reviewed language apps covered a wide range of languages such as English, Chinese, Korean, Japanese, Taiwanese, French, German, and Spanish. The student reviewers who reviewed subject-oriented apps covered a wide range of subjects such as social science, arts and psychology, music, and mathematics and information technology. Apart from a basic introduction to the app being presented, a critical review is provided with clear information on both the strengths and weaknesses of the app. Information such as language skills addressed and intended learner levels (beginner, intermediate, or advanced) is also included. For downloading purpose, the QR code of the app, app icon, and the hyperlink to the app can be found on the page.

Other than inviting specific students that had been identified as proactive users of mobile learning apps to write app reviews, in order to provide a channel for community members to share their app reviews freely with each other, an online form for app reviews has been made available, so that any community member can submit app reviews online. The MLC project team members will then check the quality of the app reviews before uploading them onto the MLC website. Appendix 1 shows the key sections of the online form for app reviews.

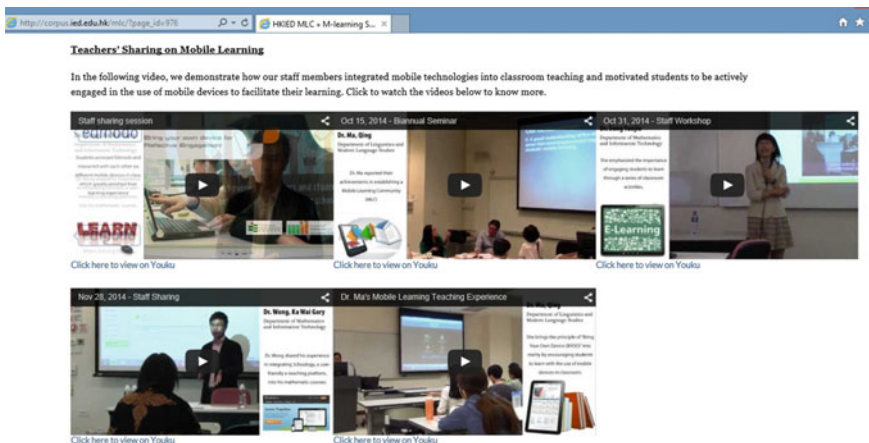


Fig. 2.3 Teachers' sharing on mobile learning

Recommended Apps/Websites

The “Recommended Apps/Websites” section features apps and websites recommended by students and teachers. The students’ section comprises dictionary applications, e-news websites, learning applications, learning websites, online dictionaries, online lexical concordances, social and communication apps, and music and videos. The teachers’ section comprises corpus-based learning resources, dictionaries, English language learning resources, general tools apps, learning management systems, machine translation, speech and pronunciation apps/Websites, online presentation apps, music education, reading apps/websites, and social media apps. The websites are categorized according to the information presented.

MLC Facebook Page

The MLC Facebook page (<https://www.facebook.com/hkiedmblearn?ref=hl>) is also developed to keep our community members well updated and informed on the activities and events (i.e., seminars, workshops, and sharing sessions) that the community has organized or participated in. A link to the MLC Facebook page is created on the MLC Website. Figure 2.4 is a screenshot of the MLC Facebook page.



Fig. 2.4 Screenshot of the MLC Facebook page

2.3.1.3 Organization of Diverse Sharing Sessions that Aim for Innovations

Although sharing of online resources is very helpful, face-to-face sharing sessions on mobile learning are equally important, as quality presentations and sharing by experienced staff and students tend to attract lots of attention, and participants get a chance to interact with each other during the Q & A session at the end of the sharing sessions. Since October 2013, over 20 different sharing sessions on mobile learning have been organized by the MLC, attracting a large audience. The sharing topics covered a range of themes that introduce innovations in teaching to staff members, with examples shown below:

- animating classroom teaching via online student response system (e.g., Socrative)
- engaging students in deep learning via learning management systems (e.g., Schoology and Moodle)
- employing wikis to promote peer teaching and learning
- creating mobile-flipped mathematics classroom using Edmodo
- teaching music via mobile apps
- developing framework for mobile seamless learning
- developing framework for mobile-assisted vocabulary learning (MAVL)
- assessing student FE using e-annotations
- assessing student coursework in a personalized way enhanced by mobile technologies

2.3.1.4 Making an Impact on Students' Learning

To ensure that the MLC will make a positive impact on students' learning, a number of activities have been organized to enhance students' various skills. These include conducting *sharing of learning stories*, inviting students to write *App reviews*, organizing *online student discussions*, and encouraging *self-evaluation*.

Through writing app reviews, students were able to exercise and enhance their critical thinking skills, as shown below in the review of the app 'TED Talk':

Strengths of the App:

TED Talk is a dedicated English-speaking website. Different experts in various fields are invited to give inspiring talks on different topics. Every lecture is creative and critical, with deep humanistic spirit. If your listening comprehension is not good, TED can offer subtitle service, and you can read English, Chinese, and even other language subtitles. Because of this, TED has become a popular speech site! You can use daily commute time to watch TED Talks on your phone. If you are going to attend TOEFL or IELTS, spending more time to listen to speeches will not only enhance your English proficiency, but also allow you to be familiar with vocabulary related to different subject areas.

Areas that need improvement:

TED has fewer flaws compared with other English video apps; the only short-coming is that the audio playing system is not functioning too well. It takes quite a long time to load the video. I think the Website developers need to solve this problem and make the app run more smoothly. Moreover, I think it can add some cartoon videos for children to watch, so as to provide a broader service to different age groups of people.

The above app review demonstrates that the student was able to critically evaluate the app and propose recommendations for improvements. This is beneficial to the enhancement of their critical thinking skills. Also, through self-evaluation, students were able to reflect on their mobile learning experience and become more aware of their own learning style and how they can self-regulate their learning more effectively. For example, one student wrote in his reflection, *“I think I have to have a more regular and frequent learning plan so that I can remember those things I have learnt [via mobile devices/technologies].”* Another student reflected, *“First, I was distracted by various free apps or games while I was studying English via mobile devices. I did not concentrate enough in this sense. Second, I hope I could focus more on learning when I use mobile devices. I will try not to be distracted by apps or games. Last, I will also try to know about different useful learning apps.”* This is an example of students trying to self-regulate their own learning when engaged in mobile learning.

2.3.1.5 Making an Impact on Staff Development

Similarly, to ensure that the MLC will make a positive impact on staff development, the staff members were engaged in a wide range of activities, such as staff sharing sessions to showcase good practices, training workshops on using innovative mobile technologies in assisting teaching, online discussion forums, and self-evaluation of mobile teaching experiences. Through these activities, staff were able to reflect on their own experiences, provide good models for others, obtain practical skills regarding the use of mobile technologies in teaching, enhance their problem-solving skills through online discussions, etc.

One member of staff reflected on her successful experience of using the social media platform WhatsApp to facilitate students’ English learning as follows:

The use of social media apps/tools strengthens students’ language skills as they have more opportunities to practice writing English or even speaking English, where students can make use of the microphone feature within the app to record their voices. It also encourages students to take the initiative to contribute their thoughts which increases their exposure to English. Furthermore an interactive channel is developed among students who are passive and less comfortable to interact in front of their peers in a classroom. Through the use of social media apps/tools, teachers are able to attend to the passive students as they may feel more encouraged to interact through a channel that avoids face to face encounters.

Through such reflections, staff were able to further enhance their own critical thinking skills and problem-solving skills. At the same time, the reflections can be

shared among other staff, which will make a positive impact, as successful experiences are shared.

2.3.2 Evaluation of Effectiveness of the Mobile Learning Community

2.3.2.1 Statistics Recorded in the Built-in Tracking System

Various evaluation mechanisms have been systematically employed to evaluate the effectiveness and achievement of the community. The built-in tracking system records traffic information of our mobile learning Website. The types of traffic information that the online tracking system can record are illustrated in Table 2.1.

The statistics and information collected by the built-in tracking system is a solid and reliable means to measure the potential international impact of the mobile learning community. The built-in tracking system of our MLC website shows that it has been visited by audiences from Asia, Europe, North America, and Africa; it has attracted more than 7,500 visitors in a year since its opening in August 2014.

2.3.2.2 Evaluation of the MLC Website by Online Reviewers

The MLC website hosts the essential mobile learning information for the community members and the people world-wide who have an interest in mobile learning. It serves as a glue to hold members together and encourage them to share and exchange learning and teaching resources. An online evaluation form was developed and placed on the website to invite all website visitors (members or non-members) to evaluate the effectiveness of our mobile learning resources published on our MLC website. The form intends to gather both quantitative and qualitative data regarding users' perceptions of various mobile learning resources. In order to evaluate the effectiveness of our website resources, questions will be asked to gather perspectives related to (but not restricted to) the following:

Table 2.1 Traffic information recorded for the MLC website

Visitors' information	Other information
1. The country the visitors are from	1. The most searched key words (i.e., visitors searched our website using which key words)
2. The total number of visitors who visited the website	2. The most visited/viewed pages/posts on the website
3. The browser which the visitors used for visiting the website	3. Comments and feedback

- Are the resources published on the website useful?
- Are the resources published on the website comprehensive?
- Which section(s) is (are) most helpful for teachers/students?
- How can the website be improved?

Finally, a 10-item Likert questionnaire coupled with a few open questions was designed and hosted on the website. Question items include the following: “The content presented on the Website is useful for mobile learning/teaching”; “I am inspired by the content presented on the website for mobile learning/teaching”; etc. Up to August 2015, 186 students have completed the online evaluation questionnaire voluntarily, and the average mean score of all the items is 4.06 (on a 5-point Likert scale), which indicates that users find the MLC website effective and valuable. The website has been considered “very useful,” “informative,” “inspiring,” and “easy to follow.” Among all the sections, most reviewers considered “Review of Apps” and “Recommended Apps & Websites” their favorite sections.

Other than positive survey data, quite a number of reviewers also gave very positive comments on the MLC website in open questions, for example:

They (resources) give me more ideas and inspiration about how to apply them to teaching and learning.

It allows me to see the mobile learning stories of students and teachers. Some of them are quite interesting and useful to me. I tried to use some of the apps recommended.

Some of the apps or websites recommended are new to me and I am eager to try some of them. Some are useful for my self-learning and some may be applied in my teaching at school.

The app reviews inform me to download the apps that I really want, because each review provides a short but clear description, strengths of the app, and areas for improvement. They provide me with a good reference for downloading the apps.

First of all, I love how the apps are recommended by students themselves with both written and spoken reviews, as well as that all the links for the apps are listed for easy navigation and download. Moreover, the homepage of the website is clear and simple to use, very user-friendly. With this website, students can easily receive information on the different apps and websites available, which could suit their studies.

2.3.3 Evaluation of MLC Activities

Other than the MLC website, various community activities have been evaluated to find out if the MLC is operating effectively. Standard evaluation questionnaires were handed out at the end of each activity; the statistics show that on average 93% of the participants agreed or strongly agreed that the sessions were valuable and

worth attending. Some participants left very positive comments, as can be seen below:

It's very inspiring! It made me think beyond technology.

Innovative, entertaining, and inspiring.

Great seminar! Should keep doing it often.

Very helpful seminar. Thanks for organising it.

The framework of reflective engagement worth attention of teaching staff. The apps for language learning are rich.

2.3.3.1 Evaluation of Member Achievement

Another criterion of assessing whether the MLC is successful is through members' achievements. In the past two years, 4 MLC staff members won excellence in teaching awards at faculty and institutional level, and one member won the prestigious President's Award for outstanding performance in teaching, and innovative use of mobile technologies in teaching is a main selling point of these staff's achievements. The effectiveness of the MLC is also confirmed in students' and staff's self-reflection, as the majority of them reported that after joining the MLC they had learned a lot from community members about new mobile technologies related to learning and teaching, and they were able to apply them successfully, which led to more effective learning and teaching.

Student members acquired new ways of thinking and tackling learning tasks such as *personalized learning* in combination with personal interests, *mobile seamless language learning (MSLL)* in building academic vocabulary, *collaborative learning* and *cooperative learning* by employing wiki technologies and *reflective learning* in making e-portfolios. The benefits from such new ways of thinking and learning are not only restricted to academic learning, but also help students to develop into *autonomous* and *self-regulated* learners, as evidenced by the reflections provided by students themselves:

Mahara is a boon for learning and self-regulation. It is not only a tool for showing learning outcome or assignment of course requirements but also more likely a diary of our life. It helps to improve myself academically and remind me that my living should reach the set goals.

What keeps me in the learning track is the seamless mobile learning. It creates unfolded learning environment. No matter inside or outside the classrooms, interactive thinking makes learning interesting. I am working in mobile learning for self-directed learning. The idea assists all age learners to manage study. The secrets of the continuous learning are on your hand. Try mobile learning to actualize and fulfill lives with bliss.

2.3.3.2 Evaluation by Invited Mobile Learning Experts

The MLC project team also invited experts in the field of mobile learning to formally evaluate the effectiveness of the MLC website and other aspects of the MLC, and the feedback received is very encouraging. The MLC website is considered a very successful platform for nurturing the growth of the MLC and for promoting mobile learning in general. One expert commented:

On the whole, the MLC website is extremely informative and comprehensive. I really appreciate the fact that most features draw on perspectives from both teachers and students, whereas similar sites often target only one of the user groups.

All in all, the MLC website is packed with a wide range of useful mobile resources for learners and teachers. It provides an interactive platform for exchanging ideas about mobile learning between students, teachers, web designers and the wider community of web users. It is recommended that the website be publicized more widely to users beyond the local tertiary education context. Learners of all levels beyond Hong Kong should benefit extensively from the resources available on this website.

The other expert also pointed out:

I am impressed with the project members' achievements in constructing a live community that is dedicated to promoting the use of mobile resources for teaching and learning. I am sure students and teachers could benefit a lot from having such a platform to share useful mobile resources and tips on using the resources. This is a great endeavor in trying to maximize the potentials of mobile devices in education. I hope this community would spread its influence to other institutions and become a consortium that could connect teachers and students from various institutions so that more people could benefit from this great initiative.

Other than the above evaluation mechanism, the MLC project team also carried out annual evaluation of the whole project, identifying strengths and weaknesses, and making suggestions for future improvements.

2.4 Conclusion

This chapter reports on the key factors in establishing a successful mobile learning community in higher education. The following key factors need to be considered: We need to recruit proactive community members strategically, construct a MLC website as a platform for resource sharing and idea exchange, organize a wide range of student and staff sharing sessions on mobile learning that aim for innovations in teaching and learning and make a positive impact on students' learning and staff development. We have also showcased how various evaluation mechanisms were used to evaluate the effectiveness of the mobile learning community. The mobile learning community established serves as a channel to promote and foster mobile

learning across the institution and beyond. The collection of rich and diverse evidence of students' and teachers' mobile learning experiences provided on the MLC website can further enhance students' mobile learning experiences and serve as a platform for academic teaching staff to obtain resources on mobile apps or technologies that can facilitate their teaching and engage students in their learning. Only through concerted efforts of members of the whole community can we promote mobile learning effectively. It is hoped that this chapter can provide some practical guidance and useful references for those who wish to establish a mobile learning community in their institutions.

On the other hand, when we reflect on the whole process of building and researching this MLC, two areas caught our attention that need further improvement. First, we need to seek for funding continuously to support the community activities. With more funding, it is possible to enlarge the MLC and integrate mobile technologies fully into learning and teaching in our institution and other higher education settings. Second, although the statistics show that our community activities and practices as showcased on our MLC Website have reached a global audience (75% of the visitors are outside of Hong Kong), their actual participation is rather limited due to geographical constraints and the fact that most of the activities are based in our institution. The project team should make more efforts to publicize the innovative practices and research findings arising from the project in international conferences and journals. Meanwhile, more online activities (e.g., Facebook discussions and student competitions) could be arranged to attract and involve more global participants.

To engage staff in SoLT through providing professional development opportunities such as the participation in the MLC, the corresponding institution plays an important role. Without strong institutional support, it will be hard to sustain such initiatives. Also, it is important to have opportunities to share the findings publicly and to apply the findings for continual improvement of learning and teaching. The MLC project team has shared the findings through numerous seminars, workshops, conference presentations, and online channels, and plan to apply the findings for continual improvement. With strong institutional support and careful planning and implementation, it is hoped that the MLC will help to broaden the conceptualization of learning (as contrasted to formal classroom learning), support SoLT work, and support staff capacity building in changing teaching practice as well as performing inquiry on the change.

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Appendix 1: Online Form for Inviting Students to Conduct App Reviews

Real Name in English: *

Name to be shown in the review: *

Contact Number:

Email: *

Particulars of Apps

Please kindly describe the particulars of the app.

Name of App: *

Operating System of App *

A. Android B. iOS C. Windows Phone D. Other _____

What aspects does this app address that are related to your major or subject course(s)? *

Whom do you recommend this app to? *

Please kindly rate this app.

Rating (5 is the highest and 1 is the lowest) *

1: Very Bad 2: Bad 3: Fair 4: Good 5: Very Good

User-friendliness**Effectiveness of Learning****Cost****Attractiveness of interface****Overall**

Example of introduction of the app

"ChemFormula is an advanced mobile app that calculates chemical formulas and balances molecular equations. An app written by chemists, it includes support for a large number of common chemical abbreviations, functional groups and protecting groups. Some formulas that the app can understand are C₆H₁₂O₆, KClO₄, EtOH, Pd(PPh₃)₄, and Boc₂O. Users of the app can simply manoeuvre around its two functions, 'analyze formula' and 'balance equations'. Analyze formula is useful as users simply need to input the formula and the app will simply run the analysis and return the results which state the empirical formula and the average molecular weight. Balance equations are also similar to analyze formula; users input the equation to be balanced and the app will perform the procedure of balancing the equation. The target language that the app uses is English."

A brief introduction of the app (minimum 100 words) *

Example of strengths of the app

"ChemFormula's built-in equation balancer can instantly help solve complex chemical equations, even those that might take years to do manually. With this mobile app, one will never have the need to solve an equation manually again. The analysis in the analyze formula section can also return results regarding suppliers that sell items with the chemical formula component that you have input for analysis. In other words, the analyze formula section can return results regarding the commercial availability of a particular chemical. Users of this app will find that the equation balancer is relatively easy to use; in addition, it can serve as a cross-checking app to double-check whether an equation has been balanced correctly when it is done manually; it is especially useful when doing assignments."

Strengths about the app (minimum 100 words) *

Example of areas that need improvement for the app

"One of the flaws with this app is related to the information regarding the vendor within the analyze formula section. Since this app is based in the US, the returned results regarding its commercial availability will list vendors within the US region. Thus the applicability and usefulness of this function is in question if the users are not from the US. Apart from that, there have been reviews saying that the app is unable to balance certain equations, therefore it is possible that there are occasions when the app is unable to derive a solution for a chemical equation."

Areas that need improvement (minimum 100 words) *

Other comments (Optional)

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Chapter 3

Learning to Engage the Digital Generation in Teacher Education

Pamela Pui-Wan Leung

Abstract The impact of digital technology in education sectors has been overwhelming. To prepare teachers in this digital era, teacher education programmes should explore opportunities for student teachers to experience e-learning pedagogies. This chapter reports a completed project on the development and use of digital lectures (DL) as an additional resource to augment conventional face-to-face lectures in a higher education institution. Working in a non-ICT background, a team of lecturers has adopted a “start from small” approach to seek answers to the following questions: (1) What forms of DLs can be adopted to facilitate student learning in courses of different nature? (2) What are the effects of DLs in facilitating students to learn in the respective course contexts? (3) What lessons have the lecturers learned in the attempt to engage students through such innovative e-learning strategies? By a “one course one digital lecture” principle, a total of nine DLs were produced by the lecturers of respective courses ranging from language studies, literature, to language teaching methods. To evaluate the effectiveness of the DLs, reflections of all the lecturers concerned were collected through in-depth interviews with the lecturers individually. Toward the end of term, a voluntary online survey and focus group interviews were conducted to solicit students’ feedback. A variety of pedagogies emerged with regard to the specific DLs produced. Sharing of practices boosted the lecturers’ confidence in adopting digital tools, and professional growth is evident in individual reflections on teaching and continuous attempts to pursue innovative pedagogies with DLs. Students in general agreed that the DLs were conducive to their learning, but they disagreed that these could replace the face-to-face lectures. In gist, regardless of ICT competency level, “reflection-in-action” is proven to be rewarding for teacher educators who are willing to explore e-learning opportunities for engaging students in the learning process.

Keywords Digital lectures • Teacher education • Digital generation

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3.1 Introduction

Students entering universities have been variously described as digital natives, neo-millennial learners, the Web 2.0 generation, the Google generation and the Net generation, etc. They are accustomed to communicating in a complex web of online networks and communities (Baird & Fisher, 2005; Prensky, 2001). Their learning methods are considered to be different from those of previous generations since they have grown up in a digital environment in which they are intensively exposed to computer-based technology (Sandars & Morrison, 2007). Recognizing that traditional live lectures have insufficiencies and are unable to fulfill the expectation of the “Net Generation”, contemporary educators have begun to use Information and Communication Technology (ICT) in the higher education sector (Shivetts, 2011). Online interactive tools such as wikis, blogs, and WebQuests are adopted as learning activities to engage students (Blessinger & Wankel, 2012). Although Learning Management Systems (LMS) such as Blackboard and Moodle have already been widely used in many tertiary institutions in Hong Kong for over a decade, the extent of e-learning implementation, and its effectiveness in enhancing the quality of learning and teaching, varies across different academic disciplines.

In light of a global trend of using ICT (particularly e-learning) in the higher education sector, The Education University of Hong Kong (EdUHK) adopted the creation of technology-enhanced learning environment in its strategic reform to provide a “total learning experience” for students. While the ultimate goal of any teaching innovations is for the improvement of student learning, the institution has provided various professional development opportunities to engage its staff in the pursuit of scholarship of learning and teaching (SoLT). From bidding for funding support to sharing of good practices within and outside the institution, staffs were involved in systematic inquiries and careful deliberations on the effective ways of addressing student learning needs.

As a part of the institution-wide reform, a “*One course one digital lecture*” project (the project) was launched in a Chinese education context. Funded by a teaching development grant, the project was an attempt to search for alternative means of teaching that would suit students’ needs. As most lecturers have little experiences in digital lecture (DL), the project has taken a broad definition to set up a non-threatening atmosphere for teaching innovations and professional development. A product is accepted as a DL, if as defined by Boffey, Gerrans, and Kennedy (2010, p. 170), it is “a digitally generated or computer-mediated counterpart of a face-to-face lecture...digital lecture can be in different forms, in their essence they are a series of words and/or pictures in a digital form”. The diversity of DL format allowed a lecturer to use various approaches in accordance with his/her teaching style. Not only were conventional software such as Microsoft Office and mp3 recorder used as the supplementary materials in direct lecturing, filming live lectures for post-production treatment was also accepted as an alternative in DL production (Demetriadis & Pombortsis, 2007). In EdUHK, Moodle was used to display links to the DLs in respective courses and collect responses from students.

The literature has attributed some benefits to DL. Students can enjoy autonomy in deciding venue and time to learn or do revisions. Besides, the “blended learning” (i.e., DL with conventional face-to-face lectures) approach has been much commended. This is because blended learning enhances students’ analytic emphasis by repeating step-by-step explanations in the digital material, and DL can create a feasible atmosphere for students to learn without the distractions often accompanying classroom lectures (Brecht & Ogilby, 2008). Nonetheless, DL also possesses its shortcomings. While courses adopting DL generally have lower drop-failure-withdrawal (DFW) rates compared to fully online courses due to the support structure of classroom (Vaughan, 2007), Bell, Cockburn, McKenzie, and Vargo (2001) revealed that the availability of flexible DL may obstruct students’ intention to attend live lectures. More importantly, students may deceive themselves about utilizing such digital medium to catch up the normal class schedule but would probably not view these digital lectures at all eventually.

Regarding the teaching effectiveness of DL, on the one hand, the role of learners is critical in DL and in an e-learning environment. On the other hand, the success of DL mainly depends on students’ self-motivation. Without such self-motivation, DL may become meaningless, because the students will not take the initiative to access the online materials on their own (Shivetts, 2011). Simultaneously, multiple studies have concluded that DL actually has no significant impact on students’ learning compared with the traditional live lectures. Spickard, Alrajeh, Cordray, and Gigante (2002) carried out a study to investigate the impact of online video lectures versus conventional lecture given to medical students and found that students in both the control (conventional lecture group) and experimental (video lecture) groups demonstrated similar levels of knowledge and learning satisfaction.

As the institution has decided that technology could play a part in SoLT, the project team thus attempted to explore whether the adoption of DL contributes to the quality enhancement of teaching and learning in Chinese teaching, the following sections report the experiences gained in the project.

3.2 Case Description

Being a leading tertiary institution focusing on professional teacher education, the EdUHK has been endeavoring to promote and support the strategic development of teacher education in Hong Kong since its establishment in 1994. Among more than 7,000 students studying in a wide range of academic programmes at different levels, about 15% are Chinese majors. Compared to other modern disciplines, Chinese Studies in Chinese societies including Hong Kong are often regarded as “traditional”, because Chinese is the mother tongue language of most local students. In addition to developing language skills, fostering traditional Chinese thoughts and values in students is another major objective of Chinese language education. Teaching is usually conducted in a traditional classroom context, where the teacher takes the dominant role, and exemplary writings and literature of distinguished

authors are adopted as teaching materials. Understandably, most teachers of Chinese, as well as teacher educators, were taught and trained to teach in a similar tradition.

As a faculty member of the Department of Chinese Language Studies, this author considers the “one course one digital lecture” scheme a meaningful step to promote e-learning in Chinese language education and a step to implement the institute’s e-learning initiative. A modest goal—one DL per course—has been set to avoid putting too much pressure on the teacher participants.

The author first approached individual colleagues in the department to invite them to participate in the collaborative project. A total of nine lecturers (including this author) in department formed a project team. Each member was committed to producing a DL for a course at their own choice and being engaged in reflective inquiry into the effective pedagogies for DL. A research assistant was employed for providing technical support and general teaching assistance. As the DL only constituted a part of a course, the course lecturer had to explore how to integrate it with the conventional face-to-face teaching. The DLs that were produced became resources for students’ self-directed learning. They also served as tangible outcomes for professional discussions on learning and teaching, and facilitated the lecturers to learn from each other.

Throughout the 2013/2014 academic year, the project roughly took three key stages from preparation, production to evaluation. Unsurprisingly, the literature review at the preparation stage did not yield much insight into the use of DL in the field of Chinese language education. While the literature has focused on studying the analytical aspects related to the positive and the negative impacts of DL on learning and teaching in other disciplines, the lecturers did learn about the different possible approaches to DL design and became more confident in designing their DLs to align with the intended outcomes of their courses. To facilitate a shared understanding of the project aims and create a common purpose for building a true learning community (Graham & Ferriter, 2010), the lecturers met from time to time both in formal settings and casual gatherings. All data of the project were documented and shared online for members’ reference. Table 3.1 reveals the major activities conducted.

Table 3.1 A summary of major activities in the “One course one digital lecture” project

Stage	Activities
I	<i>Preparation phase</i> <ul style="list-style-type: none"> • Literature review • Teacher and student online survey
II	<i>Production phase</i> <ul style="list-style-type: none"> • Digital lectures production • Interim sharing meetings among team members
III	<i>Evaluation phase</i> <ul style="list-style-type: none"> • Student focus groups • Teacher individual interviews • End-of-project sharing seminar within the department

A total of nine DLs in Chinese language studies and related fields were produced at different times and uploaded to Moodle for students' access at anytime and anywhere. Apart from Moodle, Mahara (an e-portfolio platform) was also used to help the lecturers keep records and build up a collection to showcase their teaching and learning achievements by including detailed explanation and relevant materials of the DLs. Table 3.2 summarizes the courses in experiment and the role of each DL in the specific courses, and Fig. 3.1 depicts a collection of DL entrance pages on Mahara.

Table 3.2 Use of digital lecture in courses involved in the “One course one digital lecture” project

Course description	Use of digital lecture
<p><i>1. Chinese etymology</i> Students learn to master the basic content of Chinese characters and apply the knowledge to solve the literal problems encountered when reading Chinese literatures</p>	Video capturing one of the face-to-face lessons
<p><i>2. Classical Chinese language</i> Exemplary literature and proses in the pre-Qin dynasties are adopted as main teaching materials to help students building up perceptual understanding of Classical Chinese written language</p>	Production of online teaching videos as a replacement of a routine lesson
<p><i>3. Chinese language teaching methodologies II</i> The course introduces advanced theories, content, and teaching methods related to the areas of Chinese language and literature, Chinese culture, morals, and virtues</p>	Digital assignment for students and video-taped sharing session
<p><i>4. Children's Literature</i> The course introduces the basic concepts and theories of children's literature</p>	Digital assignment followed by a video-taped sharing session
<p><i>5. Fairy love in Chinese literature</i> The course introduces Chinese literature related to the theme of fairy Love and facilitates students to analyze the ideas, contents, functions of Chinese folklores, religious literature, poets, and plays</p>	Digital assignment and online supplementary teaching videos for students, video capturing of one of the face-to-face lessons
<p><i>6. Chinese language teaching in primary school II</i> The course guides students to explore the strategies and possible combination of models of language proficiency training in the field of language teaching</p>	Production of online teaching videos as a replacement of a routine lesson

(continued)

Table 3.2 (continued)

Course description	Use of digital lecture
<p><i>7. Language teaching and information technology literacy</i> The course facilitates students to inquire the issues of Information Technology Literacy in the field of teaching, including learning and teaching philosophy and barriers in applying information technology</p>	<p>Introduction of common application software followed by digital assignment for students</p>
<p><i>8. Literature and film</i> The course helps students explore the essences of literature and film, as well as the similarities and differences of their expressing styles through lectures on theories and studying of filmography</p>	<p>Video capturing one of the face-to-face lessons</p>
<p><i>9. Instruction design and development of Chinese language for NCS</i> The course enables students to understand the key contents of the “Chinese Language Curriculum supplementary guidance (Non-Chinese Speaking students)”, and hence, select or develop appropriate teaching materials which can be applied to the teaching strategies and assessment methods for NCS students</p>	<p>Production of online videos which provide feedback on students’ assignments</p>

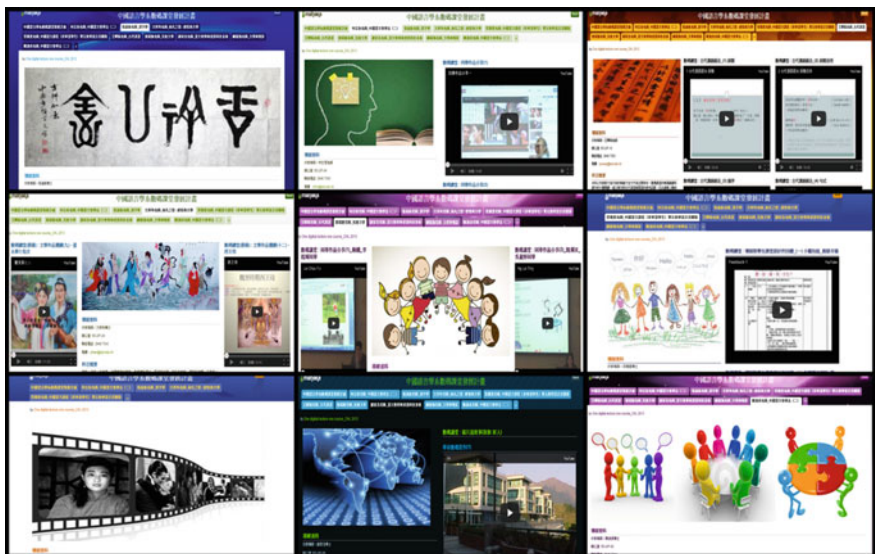


Fig. 3.1 A collection of nine DL entrance pages in the “One course one digital lecture” project

3.3 Evaluation

As eight out of the nine lecturers chose to produce their DLs for courses offered in the first semester of 2013/2014, the evaluation of the project started as soon as the second semester started. An online survey was designed to collect feedbacks of DLs from students. A total of 58 students from the related courses completed the survey. In addition, two focus group discussions involving a total of eleven students were held to further reveal students' comments on the production of DLs and their learning experience through attending DLs. Semi-structured interviews were conducted with all staff participants individually on the insights gained and lessons learnt from the project. Results of the student online survey are presented in Table 3.3. Findings from focus groups and teacher individual interviews are organized around three themes, namely ideal forms and proper use of DLs, effects of DLs in various Chinese language education contexts, and insights gained in the professional development process.

3.3.1 Overall Feedback from Student Participants

At the end of each of the two semesters, students of the courses concerned were asked to participate in an online survey after they had viewed the respective DLs. The major purpose of the survey was to collect students' general feedbacks on the DLs produced. As shown in Table 3.3, the overall results reveal that students were quite satisfied with the quality of the DLs. They also agreed that watching the digital lectures was conducive to their learning ($M = 4.19$), such as facilitating them to reflect ($M = 4.02$) and have a better understanding of the course

Table 3.3 Student online survey results in the "One course one digital lecture" project (N = 58)

	Mean	S.D.
1. The digital lectures for the course supplement my learning in class	4.19	0.661
2. The technical effects (e.g., the smoothness, visual, and audio effects) of the digital lectures were good	4.00	0.562
3. The digital lectures enhance my understanding of the course content	4.19	0.606
4. The digital lectures facilitate me to reflect	4.02	0.737
5. The teaching effects between traditional lecture and digital lecture are almost the same	3.02	1.000
6. After watching the digital lectures, I am keener to consult teachers	3.67	0.781
7. After watching the digital lectures, I hope there will be more digital lectures for different courses	3.67	0.846
8. Compared with traditional lecture, I think digital lecture is more effective in facilitating learning outcomes	3.55	0.994
9. In general, I think digital lectures can replace traditional lectures	2.69	1.217

Note Strongly disagree = 1, Disagree = 2, Fair = 3, Agree = 4, Strongly agree = 5

($M = 4.19$). Regarding the teaching effects, however, students were less inclined to treat DL in the same way as traditional lectures ($M = 3.02$); there was even a strong disagreement on the issue of replacing traditional lectures by digital lecture ($M = 2.69$).

3.3.2 Ideal Forms and Proper Use of Digital Lectures

In the project, DL has been considered as an extension of face-to-face lectures. More than 90% of the lecturers believed that traditional lectures could not be replaced by digital means. This was echoed by the students who thought that traditional lectures offered unique learning environment that could not be replaced by DLs.

Among the nine DLs, video-taping PowerPoint-aided lectures and student presentation sessions were the most common. The comment of the students on this format is that although these DLs were well-organized and helped their revision and self-study, they were unable to engage students' learning. For the few DLs that recorded a scheduled lesson, students generally had negative feedbacks. For instance, a student said that,

I do affirm the effort of teachers in making DLs, but it (producing DL by video-taping lecture activities only) does not contribute to our learning as the majority of students already heard (the content) once in live lectures and jotted notes...The feature of e-learning resources was not used well (FG20140428, S1).

The effectiveness of incorporating DL in face-to-face lectures may also depend on the teacher's beliefs. Some participants raised a concern that even the majority of the courses in Chinese language education were compatible with DL, the investment in terms of effort and resources is questionable because traditional methods might be equally effective. For instance, a participant stated that,

It is difficult to comment that whether (DL) is a suitable (pedagogy) in teaching my course....For instance, I cannot see any differences in using conventional method (i.e. listing main points in a word document), if I need to teach creative writing...It is just a matter of presentation format (CSC, T1).

While the purpose of introducing DL was not to replace the face-to-face lectures, the course content seemed to be critical in determining the potential usefulness of DLs. Using short DLs (i.e., less than 10 min) published in the format of electronic books with audio effects, the course on Fairy Love in Chinese Literature received generally positive feedback from students. However, the lecturer had reservations,

In terms of increasing the incentive of students in self-learning...I believe that it is a matter of the teaching content rather than the medium of knowledge delivery. The element of multimedia may slightly enhance students' motivation...but even if you do not use an appropriate digital means to publish the DLs, it is unlikely that students would be demotivated (MYL, T2).

Obviously, there is room for improvement. In terms of professional production standards, some students had higher expectations of DLs than lecturers. For instance, a student commented that

To improve the readability (of the DL), I think teachers should refer to the format of radio programmes on the internet (e.g., a talk show)...I still remember one show which aimed to introduce Chinese Literature was so impressive as the presenter linked his speech content using the linguistic characteristic of Cantonese (FG20140428, S2).

Whether the content of DLs should be restricted to the original course design, a few participants have thought beyond the box to redefine the role of DL in learning as the preparation or consolidation of learning and extension of teacher–learners’ interaction in assignments and reflections. For instance, to address the problem of not having enough time to provide feedback to student presentation drafts, a lecturer recorded the audio feedback over different parts of the printed drafts as DLs, and a student of the class observed that

It is common for teachers to have insufficient time for providing feedback to students as the lectures were always overrun...By recording her feedback on students’ drafts in DLs, both the time of the teacher and students can be saved (FG20140428, S3).

Some students considered putting items including introductions and top-up contents in DL useful. Not only were precious lecturing time saved, individual differences among students were also resolved as learners with higher learning ability and incentive could access supplementary resources individually.

3.3.3 Effects of DL in Various Chinese Language Education Contexts

This project was initiated on a recognition that contemporary students living in “Net generation” and being familiar with the usage of digital media might not be satisfied with “digital immigrant” (their teachers) using media from pre-digital age in learning and teaching (Prensky, 2001). The project sought to reactivate the learning motivation of these “digital natives”. In contrast to our original expectation, students generally were not motivated in using DLs. While a few DLs designed for the purpose of assessment and evaluation, the majority relied entirely on voluntary participation. The pragmatic and utilitarian mentality of the students proved to be the main obstacle in utilizing electronic assets in self-learning, as suggested by a lecturer,

Without (the encouragement of GPA) as the external factor, it is hard to mobilize (students) to watch DLs...I found that pragmatism becomes the main reason of DL failing to motivate students (ISL, T6).

In retrospect, the majority of DLs and the LMS (i.e., Moodle/Mahara) in the project were mainly used as the medium of supporting conventional lectures or tools for assessment rather than a platform for facilitating interaction. As the

end-user of DL, some students were worried that the use of DL would alienate teacher–student relationship, even though some lecturers encouraged students to raise questions through emails. Difficulties in resolving the issue of learning diversity emerged, echoing the findings of Shvetts (2011). As a student stated,

If teachers solely rely on DL, it would be difficult for them to evaluate students' performance...It is possible that slow learners may be discouraged, or even give up, if they cannot seek help from the teacher face-to-face when encountering learning difficulties (FG20140429, S4).

In some courses in which IT in education was emphasized, the degree of interaction among the lecturer and students was governed by the students' IT competency. While highflyers reckoned that the knowledge delivered in the lessons were not challenging, the low achievers may be unable to meet the standard of designated learning outcomes. In addition, some lecturers produced their DLs by requiring students to complete digital assignments. Students who possessed limited IT skills and knowledge might not be competent to complete the task on their own and required assistance. Therefore, the lecturers had to strike a balance between maintaining student motivation and the dynamics of the lectures in order to suit both groups so as to attract more students to watch the DLs.

In the successful cases of motivating students, the lecturers invited students to construct their own DL and share in the class. Such an attempt in empowering students and affirming their contribution followed the principle of leadership development that respects students' will. Not only does this reduced students' misbehavior and low learning attitude, but also increased their motivation toward lectures (Glasser, 1992).

3.3.4 Insights Gained in the Professional Development Process

As aforementioned, the project in general served not only as the digital resources for students' self-directed learning, but also as a tangible base for further professional discussions on learning and teaching. The project team's attempt to incorporate DL in course delivery in a traditional discipline constituted a mini staff professional development programme. A number of lecturers in the team highly praised the function of internal meetings and sharing in bringing synergy in nurturing innovative approaches in engaging students to acquire Chinese and related subjects, while empowering student–teachers specialized in Chinese language education to acquire techniques of adopting elements of IT in education in their future teaching career. Throughout the process, the project has enabled members to experiment unconventional teaching practices with digital technology and perform systematic inquiry on any possible change, realizing the gist of SoLT.

3.3.4.1 Adhesive Power of a Learning Community

While as noted above it is debatable if the students have benefited from the project, the lecturers definitely have gained much. On the one hand, the published DLs formed an e-portfolio for the lecturers to record their e-learning practices and for further professional exchange and sharing. On the other hand, through the sharing of personal experience and insights within the project team, the lecturers were stimulated to explore more possibilities of effective e-learning pedagogies and teaching practice. Such continuous sharing occurred in either formal occasions, such as seminars and workshops, or informal leisure chat. It can even be said that a culture has emerged in the department as there were subsequent projects on the development of DLs within the framework of Chinese education. As a lecturer remarked,

I believe that (this project) has effectively organized colleagues in sharing their insights, so we can conclude from these fruitful experiences useful pedagogical practices through brainstorming (MYL, T2).

Developing a Community of Practice (CoP) (Wenger, McDermott, & Snyder, 2002) was in fact a key objective of this project. From the start, participants have viewed the project as a journey of exploring e-learning pedagogies in the context of Chinese education. Several lecturers commented that they were able to redesign their course content and adjust their intended learning outcomes by putting themselves in student's shoes during the process of the project. They generally commended the project for allowing them to discover the diversifying nature of DL and thus inspiring them to create new teaching methods under a supportive professional community. The author, as the project leader, has succeeded in using the DL project as an adhesive to bond the specialists in Chinese language education, facilitating the exchange of knowledge and diffusion of innovation (Rogers, 1995).

A secure sharing community for teachers' professional development is thus nurtured. Using rubrics for assessment suggested by Cambridge and Suter (2005), the effectiveness and quality of CoP in the project can be revealed under four progressive criteria:

Building relationships

The foremost criterion emphasizes that a strong professional community is fostered by frequent synchronous and asynchronous interaction to build relationships of trust, mutual respect, and commitment which motivate group members to share ideas. In this project, the participants met frequently to share their ideas and insights about the design of DL with each other. Sharing and observations not only enriched participants' understanding, but also they enabled the participants to reveal more possibilities of DL. As some lecturers reflected,

It (the literature review) actually enlightens me on the understanding of DL...DL should not be considered as the tool of distance learning solely...My wrong conceptions are probably from the impression of distant learning programmes... (CSC, T5).

I finally realize the format of DL can be as diversified as what we did after joining the project... It is not necessary to operate the lesson with DL entirely (MYL, T2).

I am always searching for alternatives in maximizing potentials of DL for promoting teacher-student interaction...In the light of making an effort to experiment new electronic pedagogies, I am very excited (LPW, T3).

In some circumstances, the lecturers were re-energized, and they amended their e-learning strategies after reviewing the positive feedback and results of student evaluation of teaching, echoing the initiative of Scholarship of Learning and Teaching (SoLT) (Ochoa, 2012).

As the project progressed, a few lecturers revealed interest in producing more DLs. Undoubtedly, the project has helped enlighten the participants about various teaching strategies and practices, including the acquisition of new digital technology such as new software. In an attempt to engage student learning, the lecturers became actively engaged with the learning community.

Learning and developing the practice

The second criterion stresses on how the participants' personal practice can be integrated and knowledge organized in a way that reflects their perspectives. For a successful practice development, both physical productions, including documents and tools, and individual thoughts from community members should be well balanced and established in the final outcome of the project. In this regard, the project team organized several seminars to share their experience in applying DLs and the project findings within the EdUHK community. A paper on the project was presented at an international conference. Besides, an individual reflection on the use of DL was collected from each lecturer and uploaded to the Mahara platform for online sharing. The ideology of showcasing all members' ideas in a systematic way and fostering deep learning experiences for members under the concept of CoP was realized. The completion of the initial project signaled the start of its follow-up phase to further promote the production and adoption of DLs in the same department. Providing opportunities for sharing SoLT experiences publicly was proved to be an effective means to stimulate members' interest in continual improvement of learning and teaching.

Taking action as a community

To define whether a community is successful, the community should reveal the characteristic of helping members create personal relationships and producing the resources for practical usage. In this project, participants successfully produced nine DLs in various Chinese language education domains. These included Chinese Etymology, Chinese literatures and IT in language education, and Chinese language teaching methods for first language speakers and for non-Chinese speaking students. All DLs were produced under a secure and supportive community, with technical assistance provided by the research assistant. Digital technology has not only facilitated the project participants to broaden the conceptualization of learning, but also supported their capacity building in changing teaching practice. With the feedback collected from the lecturers and students, the DLs produced laid a solid

foundation for reviewing course development and delivery within and outside the department.

Creating knowledge in the domain

Finally, the fourth criterion is that members who belong to a successful learning community should have the ability to go beyond current practice to explore the cutting edge of the domain, or work with people from other aspects to explore emerging ideas. At first, the project has set a modest target to explore possible teaching innovations in the field of Chinese language education. Throughout the project, the participants have gained a better understanding of the genuine needs of the “Net generation” and discovered the potentials of DLs in facilitating student learning in the typical conservative discipline. These insights were important catalysts of change in the participants’ teaching practices. Besides, systematic inquiry on the change has deepened the participants’ reflection on their teaching and enhanced their capability to create knowledge in the domain. When asked about the project sustainability at a sharing seminar, the project team was excited to announce that there would be a serial of DLs with a focus on enhancing the quality of Chinese language teaching. To a certain extent, the project has contributed to initiating and developing e-learning, both at the individual lecturer level and in the discipline in general.

3.3.4.2 Importance of Maintaining Staff IT Proficiency and Administration Support

Given the fact that this project was a fresh attempt in large-scale production of audio–visual e-learning materials for Chinese language education in the department, the project team’s computer literacy for establishing multimedia assets in learning and teaching was rather limited. Less than half of the members reckoned that they had sufficient ability in adopting DL. Other members who were novice in this field encountered more difficulties owing to insufficient time and heavy workload for acquiring additional IT techniques in producing DLs. Even students in the focus group interviews were concerned that the limited digital literacy may hinder lecturers in adopting this digital approach for teaching. Hence, these students also had doubts as to what extent they should use DL in their future career. For instance, a student who completed a digital assignment on producing a DL stated that

It is hard to handle the massive workload of the DL production by myself...without the assistance from a technique support team...I do not think I can follow the group project and continue my DL production throughout the whole semester (FG20140429, S5).

Against this backdrop, the research assistant played an important role in providing IT support for the project members. Most importantly, the individual-based consultation provided by the research assistant avoided the embarrassment for the lecturers who had only relatively low IT proficiency. The assistant not only helped ease the digital divide, but also he served as a mediator in organizing administrative tasks systematically without hindering the work schedule of the lecturers. A few lecturers mentioned that without the presence of an assistant competent in detailed

planning and setting reasonable timeframe, the implementation of this project would bring adverse impacts on their routine work. To this end, the teaching development project funded by institution provided critical support to the development of SoLT which required digital technology in particular. All the lecturers agreed that proper administrative support and sufficient IT proficiency were crucial to the success of future e-learning projects.

3.4 Concluding Thoughts

This chapter reports how the “One course one digital lecture” project has facilitated Chinese language educators to adopt innovative e-learning strategies and engaged students in the learning process. With limited IT proficiency, the project team has not produced immensely innovative DLs, but the project has succeeded in enlightening the lecturers to search for alternative e-learning approaches with the formation of an effective learning community in an academic department.

In terms of developing e-learning pedagogies and putting these into Chinese language teaching and learning, the project accomplished the objectives by providing supplements and assignments in various Chinese disciplines, such as Chinese language teaching methods, Chinese literatures, and instructional design of Chinese language for non-Chinese speaking students, using Moodle and Mahara as dissemination platforms. Not only have the teacher participants gained from the project, but also other colleagues in the department also participated in regular sharing meetings. The wider community in the EdUHK has benefited through open seminars organized by the project team too. These activities allowed the project team to present their personal experiences and reflections related to the project and motivated other colleagues to try this approach on their own. Eventually, a professional learning culture in the department was cultivated with some success, providing colleagues with opportunities to critically reflect on their own teaching and learning practices (Clarke & Hollingsworth, 2002) through scholarly conversations.

To implement an e-learning project such as this one, it is important to recognize that most teacher participants would encounter difficulties in adopting new pedagogy combined with unfamiliar IT techniques. As a result, not only should sufficient logistic support be provided, the design of project should also allow members to gain satisfaction through discovering the effectiveness in engaging students. Below are some principles and experiences obtained from this project,

- Graded assignment should be included in the DL design for boosting the usage of electronic learning and teaching assets,
- Secure learning atmosphere is essential for nurturing a community of practice,
- Lectures with multimedia and storytelling context can effectively motivate students,

- Though DL cannot entirely replace conventional face-to-face lectures, it can be used in preparatory and consolidation phases of a course, and
- Administrative and technical support is needed in facilitating e-learning project implementation.

While there is still room for improvement, students were generally satisfied with the quality of the DLs produced. Also, lecturers in the department have gained confidence in using digital means for promoting learning and teaching in Chinese. The overall positive feedback obtained from this attempt motivated the project team to continue its endeavor to use IT in Chinese education. DL will definitely not replace conventional lectures, at least in the near future, but with good planning and realistic expectations, the project has concluded that the potentials of DL could be exploited in order to facilitate Chinese language education in tertiary education.

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Chapter 4

Technology Integration for Student-Centered Learning: A Model for Teacher Professional Development Programs

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Abstract The use of digital technology for the improvement of teaching and learning has been the focus of many educational reform efforts in recent years. Access to digital technology and the reported frequency of its use in classrooms have increased. However, several studies have shown that meaningful integration of the technologies with effective pedagogical strategies has not happened. While the affordances of digital technologies can enable student-centered learning and promote higher level learning outcomes, teaching practices with technology have largely followed the information transmission model. Lack of research on effective integration of technology, especially in higher education settings, has led to the problems such as ineffective use of technology and lack of dissemination of good pedagogical practices at a systemic level. In this article, we describe a model, *Attain-Align-Integrate-Investigate*, for teacher professional development programs on effective technology integration. We apply the model to design and deploy a large-scale (4000 participants) teacher professional development program in a higher education engineering context in India. We present evidence of teachers effectively integrating the technology with student-centric teaching practices.

Keywords Student-centered learning · Staff profession development · Technology integration

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4.1 Introduction

The use of information and communication technologies in teaching and learning provides several benefits due to their affordances, and hence should be used to promote student-centered learning (Howland, Jonassen, & Marra, 2012). While access to digital technologies and the reported frequency of use in classrooms have increased (Greenhow, Robelia, & Hughes, 2009), challenges related to technology-supported student-centered teaching remain. Inadequate preparation of teachers to use technology and implement new instructional strategies (Brown & Warschauer, 2006), and teachers' beliefs and attitudes toward technology (Ertmer, 2005) have prevented meaningful integration of technology with effective pedagogical strategies. Despite its known benefits, student-centered learning approaches with technology are still not common, and the use of technologies is often limited to information transmission (Lim & Chai, 2008).

Teacher professional development programs at the K-12 level have emphasized the integration of technology with constructivist pedagogical practices (Howland, et al., 2012). However, at the tertiary level of education, there is an increasing need for professional development programs to help teachers engage in scholarly teaching (Streveler, Smith, & Pilotte, 2012). The Course Design and Teaching Workshop at McGill University (Saroyan, et al., 2004) and National Effective Teaching Institute Program (NETI) (Brent & Felder, 2009) at North Carolina University are two short-term training programs that specifically target this goal. A similar process is discussed in the MARCH^{ET} training program (Rienties et al., 2013) to train faculty in redesigning their own course by integrating technology. Yet, these programs may be difficult to adapt under different contexts, and there is an absence of validated teacher training models that allow adaptations into a short-term teacher professional development programs (Felder, Brent, & Prince, 2011).

To address this gap, we developed the Attain-Align-Integrate-Investigate (A2I2) model to design teacher professional development programs targeting the goal of effective technology integration for student-centered learning. The model informs the choice and organization of the content of such professional development programs, as well as the format of activities to be conducted in the program. Based on the concept of constructive alignment (Biggs, 1996), the model prescribes that the content of such programs include core modules of: learning objectives afforded by the technology, instructional strategies aligned to the technology and assessment using the technology. Following the design principles of pertinency and immersivity, the model recommends that the program content be situated within relevant teaching-learning problems, and the program be conducted using active learning strategies. The A2I2 model combines both scholarly teaching practices and action research, thus elevating the practice of teaching towards the Scholarship of Learning and Teaching (SoLT).

Based on the A2I2 model, we designed and implemented ET4ET (Educational Technology for Engineering Teachers)—a large-scale blended mode program for

engineering college instructors in India. This training program empowers teachers with critical skills required for effective technology integration. The program ensures that the teachers gain expertise in constructive alignment practices with technology. Thus, teachers broaden their conceptualization of teaching–learning, which is a prerequisite to conduct inquiry on their own practices (Strevler, Borrego, & Smith, 2007). The ET4ET program further advances evidence-based inquiry practices by mentoring teachers to conduct classroom action research. In line with the goals of SoLT, the ET4ET program provides participants with a platform to report their practices and action research findings among a larger community of teachers in the country.

In this chapter, we describe the A2I2 model and its application to the design and implementation of the ET4ET professional development program for engineering instructors. We report results of the evaluation of the program on teachers’ beliefs, competence and practice of technology integration and student-centered teaching. The intended audience for this chapter includes designers of teacher professional development programs, administrators, policy makers, and educational researchers involved in scaling up implementations. Teacher professional development program designers can use the A2I2 model described in Sect. 4.3 and the implementation of the ET4ET training program in Sect. 4.4 to design their own training programs. Administrators and policy makers will find the overview diagram (Fig. 4.1) in Sect. 4.3 and the results in Sect. 4.5 useful while formulating teacher professional development programs in their own context, and benchmarking results. Educational researchers involved in scaling up implementations may find Sect. 4.2 useful for

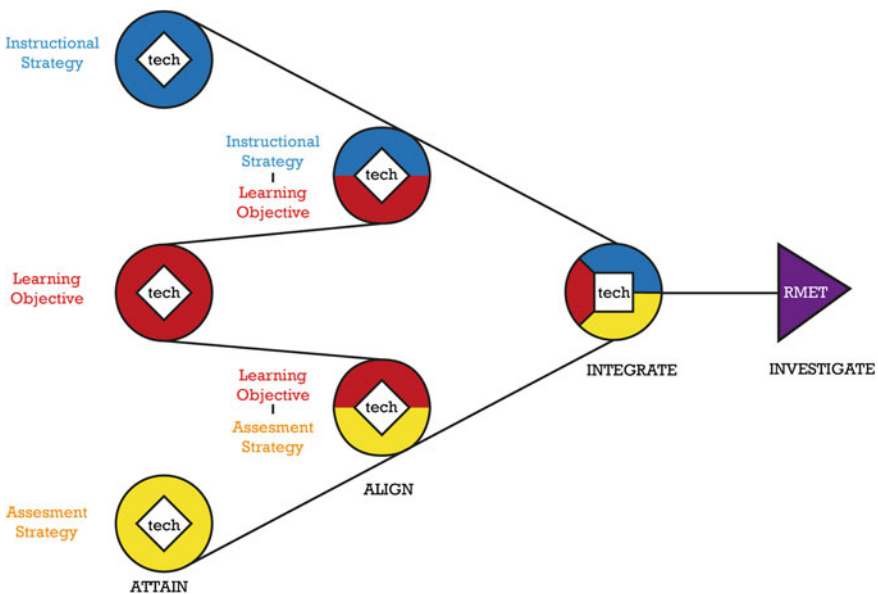


Fig. 4.1 Attain-Aligned-Integrate-Investigate model

understanding Design-based Implementation Research approach that we followed to develop the model. Based on our experience and the evaluation of the ET4ET program, we share recommendations (Sect. 4.6) for others who may wish to design such programs.

4.2 Research Basis for A2I2 Model

Within the context of engineering education, the *levels of inquiry* (Streveler, Borrego & Smith, 2007) explains the transition of a teacher across the five levels of teaching, effective teaching, scholarly teaching, scholarship of teaching and learning and engineering education research. SoLT has thus been placed at the transition between scholarly teaching and educational research. A barrier in targeting the SoLT in the context of Indian engineering education is the lack of preservice training to engage teachers even at the level of scholarly teaching practices. The A2I2 model addresses this gap by engaging engineering college teachers first to scholarly teaching practices, followed by a guided transition into SoLT.

4.2.1 Theoretical Underpinnings of the Model

The goal of the A2I2 model is to provide a framework to design teacher professional development programs focused on effective technology integration for student-centered learning. The underlying theoretical basis of the A2I2 model consists of constructive alignment, spiral curriculum, immersivity, and pertinency. These principles provide the foundation for A2I2-based training programs to address the above primary goal.

For teachers to engage in scholarly practices, they need to be able to align the content (or curriculum), assessment, and instruction (or pedagogy) for their regular teaching–learning transactions. This is captured by the concept of *constructive alignment* (Biggs, 1996), and it enables students to achieve higher cognitive levels in their learning practices. Constructive alignment is known to promote deep learning among students (Wang, Su, Cheung, Wong, & Kwong, 2013).

The A2I2 model prescribes the application of *spiral curriculum* to organize and sequence the content of training programs based on it. Spiral curriculum is characterized by an iterative process of revisiting the contents, with successive iterations looking at the topic in a greater depth for the learner to build on his initial understanding (Bruner, 1977; Harden & Stamper, 1999). The aim of the A2I2 model is to enable teachers to solve their own complex, teaching–learning problems. The spiral approach used in the training provides them with not only the relevant techniques of technology integration and student-centered learning, but also the repeated experience of solving real-life problems at increasing levels of depth.

Immersivity is defined as the feature of the learning environment that drives participants to be involved in a set of meaningful activities (Howland et al., 2012) and to get cognitively engaged in the content (Sherman & Craig, 2002). *Pertinency* of teacher training content is defined as the training participants' perception of degree to which the given content is applicable for his/her teaching immediately after the training. This idea builds upon the element of job relevance (Venkatesh & Davis, 2000) by adding the constraint of immediate practice.

4.2.2 Evolution of A2I2: Design-Based Implementation Research

The A2I2 model discussed in this chapter evolved from three iterations of design, implementation, and evaluation of training programs (Warriem, Murthy, & Iyer, 2014; Murthy, Iyer, & Warriem, 2015). To cater to the need of both design and implementation, we used the Design-based Implementation Research (DBIR) method. The DBIR philosophy belongs to the broader umbrella of educational design research methods that operate within the intersection of research and practice and helps in bringing interventions to scale (Fishman, Penuel, Allen, Cheng, & Sabelli, 2013). The core principles that characterize DBIR are as follows:

- *Focus on persistent problems of practice from multiple stakeholders' perspectives.* The problem being tackled in our context was that of providing teachers with training in effective technology integration for student-centered learning. The stakeholders within each iteration included the training program designers (who are also the researchers), organizers of the 'Train 10000 Teachers' project (a part of a national initiative of the Indian government), participant institutions, and teachers.
- *Commitments to iterative, collaborative design.* All training materials were initially developed through collaboration between the researchers and a few teachers from the participating colleges. These were then refined based on the feedback and evaluation at the end of each iteration.
- *A concern with developing theory and knowledge related to classroom learning and implementation through systematic inquiry.* Major theoretical inputs provided by the iterations, apart from the A2I2 model, were the principles of immersivity and pertinency (Warriem, Murthy, & Iyer, 2015) in training design.
- *A concern with developing capacity for sustaining change in systems.* Sustainability is an important driver of training programs developed on the basis of the A2I2 model. The underlying theoretical principles of immersivity and pertinency, and the final investigate phase of the A2I2 model help address the goal of sustainability.

The first and second iterations of the model contained only three phases: attain, align, and integrate. In the first iteration, we found that a face-to-face training program based on the model was beneficial for shifting the attitude of teachers

toward student-centric learning. However, the technologies used were unfamiliar to teachers, and insufficient exposure led to poor technology integration in their lesson plans. This led to the second iteration where a larger emphasis was given to immersion into the technology. Teachers were immersed in meaningful activities with technology in their own contexts; for example, they created a wiki page to use in group projects for their own course. In addition, the model was used to scale up the training program to larger numbers and different modes (blended mode with synchronous and asynchronous online modules). Participant responses once again showed a conscious shift toward learner-centered approaches and an effective integration of technology in their lesson plans. The third iteration of the model (Sect. 4.3) includes an additional investigate phase at the end that allows teacher participants to systematically examine the effectiveness of their lesson plans, thus guiding them into the practice of action research.

4.3 A2I2: The Model

Figure 4.1 shows the broad outline of the content and flow of A2I2 model, with each of attain, align, integrate, and investigate phases. The model contains three core modules of learning objectives (red), instructional strategies (blue) and assessment strategies (blue), and pertinent technology (white parallelogram inscribed in circle).

The main design components of the A2I2 model are as follows: phase, focus, module, format of activities, technology immersion, and expected output (Table 4.1). The model provides recommendations to teacher professional development designers to make decisions for each of these components and suggests the role of the participants of the professional development program at each phase. The underlying theoretical bases of the A2I2 model, viz. constructive alignment, spiral curriculum, immersivity, and pertinency, inform the design of these training programs.

- *Phases and focus*—There are four phases, viz. attain, align, integrate, and investigate. In the attain stage, the model prescribes a focus on an introduction to concepts, so that participants attain preliminary knowledge on the three core modules of learning objectives, instructional strategies, and assessment strategies, and on the affordances provided by the technology. The instructional strategies are student-centered as recommended by constructive alignment. The align phase looks at pairwise alignment between the modules. At the same time, there is an increasing depth in the coverage of module. Participants are expected to have some mastery on the content at the end of the phase as the designed activities increase in complexity. In the integrate phase, all the three modules get integrated along with effective use of technology. The complexity and depth of each of the module are largest in this phase. Thus, guided by the spiral curriculum, the three core modules are revisited as we move forward in the A2I2

Table 4.1 Features of A2I2 model

Phase	Focus	Module		Format of activities	Technology immersion	Output
		Topic	Knowledge level			
Attain	Attaining an introduction to concepts	Contains one of the three core modules: (1) Learning objective (LO) (2) Instructional strategy (IS) (3) Assessment strategy (AS)	Targets <i>recall</i> or <i>understand</i> type of knowledge related to one of the three core modules. For example, how to write a correct learning objective or how to execute the steps of a particular instructional strategy	Most activities are instructor-led, such as introduction to concepts, summary of duration 5–15 min. each. Some activities are participant-driven individual activities of duration 5–10 min. each	First, instructor-guided activities on using the technology, followed by the explanation on the affordances of technology	Identification of learning objective (LO), instructional strategy (IS), and assessment strategy (AS) relevant to their own course and use of technology to display them
Align	Aligning modules pairwise along with deeper knowledge	Involves the alignment of two of the three core modules: • LO and IS • LO and AS • IS and AS	Targets <i>apply</i> level of knowledge related to use of an instructional or assessment strategy for achieving a learning objective, or choice of a technology with an instructional strategy for a particular learning objective	Majority are participant-driven individual activities such as constructing material for own course, such as microteaching	More <i>evaluate</i> -level activities followed by instructor-guided activities so as to align the affordances of technology with its intended use	Examples of pairwise aligned modules within their own course with the use of technology: (a) LO-AS (b) LO-IS (c) IS-AS

(continued)

Table 4.1 (continued)

Phase	Focus	Module		Format of activities	Technology immersion	Output
		Topic	Knowledge level			
Integrate	Integrating the knowledge gained	Address the integration of all three core modules—LO, IS, and AS	Targets integrate phase target <i>create</i> level of knowledge for combining the three core modules. For example, creation of a lesson plan with the use of a specific technology	Most activities are participant-driven and collaborative in nature. For example, writing a lesson plan in a group, with participants of the same domain	Integrating technology within the lesson plan	An integrated lesson plan for one lecture within their course which integrates technology
Investigate	Investigating the effects of practice	Research methods in educational technology	Targets investigate target basic research methods' knowledge of the participants	A mix of instructor-guided and participant-driven activities	Identifying innovative ways of using technology and its evaluation strategies	A proposal for a research study investigating effectiveness of a teaching-learning strategy using technology

phases, but each time at greater depths that involve overall integration. Finally, the investigate phase helps in providing introduction to the basic idea of educational research so that participants get motivated to move toward action research within their own practice.

- *Module*—This deals with content and level within each phase.
 - *Topics*—This specifies the various topics and subtopics under the main modules of learning objective, assessment strategy, instructional strategy, and technology.
 - *Level of knowledge*—This specifies the cognitive level of the learning outcomes, as per revised Bloom’s taxonomy (Anderson, Krathwohl & Bloom, 2001), corresponding to each topic.
- *Format*—This specifies the format of activities in each phase. Overall, the A2I2 model prescribes the use of active learning strategies. There are three main types of activities, viz. instructor-driven, participant-driven individual, and participant-driven collaborative activities. The role of participant varies from a learner to that of a teacher across the various activities. Instructor-driven activities are recommended to be of a shorter duration, as studies show that the average attention span of an adult learner is ~20 min (Cornish & Dukette, 2009). More time is recommended for participant-driven collaborative activities, most of which employ active learning strategies.
 - *Instructor-driven*—These are activities in which the instructor plays the major role, e.g., lecture, demonstration, and summary. The A2I2 model recommends that the activities be designed so that the role of the participant within these is that of an active learner. Instructor-driven activities are recommended in the attain phase.
 - *Participant-driven individual*—These are activities in which the participant performs the task individually and turns to instructor only for feedback, e.g., working out an example individually and solving a question. Since participants are solving real-life teaching–learning problems, the model demands that the role of participant becomes that of a teacher during these activities. Most activities in the align phase are recommended to be participant-driven individual activities.
 - *Participant-driven collaborative*—These are activities in which participants work in a group to solve a teaching–learning problem faced by them in class or perform an activity posed by instructor, e.g., Think-Pair-Share or Peer Instruction. The model prescribes that the majority of activities participants be primarily engaged in the integrate phase are participant-driven collaborative activities.
- *Immersion of technology*—This explains how to what extent participants get exposed to the technology. The principle of immersivity recommends that training program activities should be designed such that the participant engage with the content first as a learner and then as a teacher. Since participant is mostly in the learner mode in attain phase, the immersion of technology as

suggested by A2I2 model requires participant to perform teacher guided activity in the attain phase. In the align phase, participants are in the role of teachers and hence evaluate the affordances of technology to achieve the intended learning objectives.

- *Output*—This specifies the tangible output at the end of each phase, which provides the participant with flexibility in application and the needed reflection on outcomes. The pertinency principle of A2I2 demands that these outputs be of immediate relevance to the participant in their own practice.

Overall, immersivity and pertinency help in the selection and design of activities, selection of technology, and examples within each module.

4.3.1 Using the A2I2 Model

The A2I2 model is primarily useful for designers of teacher professional development programs as an instructional design model to develop short-term training programs for effective technology integration. At the broad level, the phases within A2I2 will help the training program designer to select and organize the contents of the program. Going a level deeper, Table 4.1 can help the trainer to design various activities within individual phases of the training program. The focus of each phase will help the trainer to identify the target levels of content and activities required at each phase. The format and immersion level specified by the A2I2 model will help the trainer to design instructional strategies across each phase to achieve the intended learning outcomes. The output at the end of each phase helps the training designer evaluate the intended learning outcomes of the program based on a tangible product created by the training program participants. Finally, the guidelines in the investigate phase will help the trainer to introduce educational technology research methods to scaffold the participants in performing action research.

4.4 Application of A2I2 Model: The ET4ET Program

The A2I2 model was implemented to design and develop a large-scale teacher professional development program: Educational Technology for Engineering Teachers (ET4ET). The ET4ET program was conducted under the Teach 10,000 Teachers project (T10KT, 2015), a part of a national initiative by the Indian government, the National Mission of Education through ICT (NMEICT, 2015). The goal of the T10KT project is to enhance the teaching skills of engineering college faculty. For this, 2–4 week professional development programs in the form of workshops are conducted on the teaching of various engineering topics. The T10KT project provides the infrastructure for conducting such programs via a blended learning approach involving synchronous remote classrooms and asynchronous online modules. Engineering college teachers attend the workshop at one of the 200

+ remote centers across the country, where they participate in the synchronous sessions that include live two-way audiovisual interaction. In addition, Moodle is used for asynchronous interaction, such as for assignments and for quizzes.

The main objective of ET4ET was to train engineering college teachers across the country to implement ICT-supported student-centric teaching practices. The ET4ET program was conducted in January 2015. Participants were 4358 engineering college teachers who attended this program from 148 different colleges across India. The participants were from diverse domains of engineering and basic sciences. The training program spanned 4 weeks and was split into four parts:

- Part 1: Face-to-Face Synchronous Sessions—3 days
- Part 2: Asynchronous Online Sessions—12 days
- Part 3: Face-to-Face Synchronous Sessions—3 days
- Part 4: Asynchronous Online Sessions—10 days

The schedule for the ET4ET program is shown in Fig. 4.2.

	Day 1	Day 2	Day 3
Session 1	D1AM1: Setting Expectation	D2AM1: Concept mapping as a tool for course planning	D3AM1: Assessments for Higher Order Thinking Skills
		Break	Break
Session 2	D1AM2: Learning Objectives - What and Why?	D2AM2: Digital Blooms Taxonomy	D3AM2: Rubrics - Assessing Open Ended Tasks
Session 3	D1AM3: Lab	D2AM3: Lab - Exploration of Technology Tools	Lab
	Break	Break	Break
Session 4	D1PM1: Hierarchy of cognitive levels	D2PM1: Interactive Visualization for Higher Order Learning	D3PM1: Flipped Classroom
	Break	Break	Break
Session 5	D1PM2: Lab - Active Learning Using Peer Instruction	D2PM2: Lab - Active Learning Using Think-Pair-Share	D3PM1: Lab - Create video for Flipped Classroom
Session 6	Q & A		
ONLINE PHASE-1 (Flipped Classroom, Interactive Visualizations)			
	Day 4	Day 5	Day 6
Session 1	D4AM1: Feedback on Online Assignments	D5AM1: Effective integration of technology followed by live Q&A	D6AM1: Converting your Idea to a Research Study
	Break	Break	Break
Session 2	D4AM2: Peer Review of Question Paper followed by live	D5AM2: Lab Assignment - Lab Assignment - Exploring Visualizations, Creating in-class activity with Visualizations	D6AM2: From Idea Planning -> Idea Proposal -> Study Planning
Session 3	D4AM3: Lab - Revise assignments		
1:00 - 1:30 1:30 - 2:00	Break	Break	Break
Session 4	D4PM1: Bringing in Collaboration through Technology - Wiki, Forums	D5PM1: Creating your Lesson Plan for 1 hour topic(Integrate Lesson Plan).	D6PM1: Consolidation - ET4ET followed by live Q&A
	Break	Break	Break
Session 5	D4PM2: Reviewing AL Strategies (Sorting of TPS, PI) Lab	D5AM2: Portfolios for your course Lab Assignment - Portfolio	Valedictory Session
Session 6	Q & A		
ONLINE PHASE-2 (Wikis, Final Lesson Planning and Reflection)			

Fig. 4.2 Schedule of ET4ET training program

Table 4.2 Active learning strategies and resulting engagement

Session	Day I		Day II	Day III		Day IV		Total
	2	4	2	1	4	1	4	
Time in min for active learning (% of session time)	31 (34%)	30 (33%)	29 (32%)	47 (52%)	30 (33%)	44 (49%)	5 (17%)	216 (51%)
No of active learning activities	4	4	7	11	3	6	2	37
No of participant interactions	347	427	1336	1090	492	874	227	4793

4.4.1 Immersivity and Active Learning in ET4ET Program

The immersivity principle is key in creation of an engaging session to the participants. As training designers, we followed the A2I2 model to adapt active learning strategies within the program to ensure the engagement of participants. Table 4.2 shows engagement data related to these active learning strategies. The evidence for engagement comes from the chat messages received during the synchronous remote sessions during the implementation of the strategies. From Table 4.2, we see that 37 active learning strategies were used across 7 sessions that totaled to 3.5 h of active engagement (or 51% of instructional time). In terms of participation by individual colleges (i.e., remote centers), we see that the average interaction per strategy is 130, i.e., 87.8% participation.

The participants were provided with 8 wiki tasks that required them to create 4 different wiki pages per person and 1 page per college (remote center) and perform at least 10 edit operations. It was seen that over the course of the program, 1009 different participants had generated 6279 pages and performed 21,487 edits. In terms of activity presence within the wiki, we can see that participants have created an average of 6 pages per person and performed 21 edits per person.

4.5 Evaluation of ET4ET Program

We evaluated the ET4ET program by investigating how teachers’ belief, competence, and practice have changed within the context of student-centered practices and technology integration. Our research questions are as follows:

RQ1: To what extent have the teachers moved to student-centered practices?

RQ2: To what extent have the teachers become competent in use of technology?

RQ3: How effective are the teachers in integrating technology in their own practice?

4.5.1 Teachers' Belief About Student-Centered Practices

We answer first research question (RQ1) by analyzing teachers' perception of learning and intention to apply these strategies in their own courses. We use the example of an active learning strategy, Think-Pair-Share, that was extensively used in the ET4ET program sessions. A total of 8 Think-Pair-Share strategies were used within the ET4ET program. Think-Pair-Share was also one of the instructional strategies that were discussed in the attain, align, and integrate phases. Assignments were given in the ET4ET program on creating Think-Pair-Share activities for their own course. Participants had submitted a total of 3013 assignments on the creation of Think-Pair-Share activities in their own course.

The data source to identify teachers' beliefs included two questions from a 5-point Likert scale questionnaire (in addition, the questionnaire contained other questions on various topics related to the workshop). The two questions used for this analysis were based on constructs of perceived learning and intention to apply, which are important constructs while investigating teachers' beliefs (Muijis et al., 2004). The questions were asked in the context of Think-Pair-Share strategy that participants used extensively. The questions were: "I learnt how to set up a Think-Pair-Share activity in my class through Moodle activities and assignment on Think-Pair-Share" and "I intend to use Think-Pair-Share activities in my course in the coming semester." The survey questions had a Cronbach's alpha of 0.764 indicating good reliability.

The questionnaire received 1203 responses. The responses showed that 89% of participants had positive perceptions about learning and intention to apply Think-Pair-Share strategies in the workshop. Table 4.3 summarizes the results related to participants' perception of learning and intended use of Think-Pair-Share within the ET4ET program.

4.5.2 Teachers' Competence in Use of Technology

The training program used technologies such as interactive visualizations, wiki and screencasts. To answer the second research question (RQ2), we consider participants' perception of confidence in use of wiki and screencasts using responses to survey questionnaire and frequency of assignment submissions. Wikis and screencasts have been chosen primarily because more than 50% of participants had indicated lack of knowledge or use of these technologies within their current practice at the start of the workshop.

Table 4.3 Questionnaire responses on Think-Pair-Share strategy

Think-Pair-Share	Perception				
	SD	D	N	A	SA
Learning	18 (2%)	5 (0%)	106 (9%)	723 (60%)	350 (29%)
Intention to apply	16 (1%)	6 (0%)	122 (10%)	697 (58%)	362 (31%)

Table 4.4 Competence of teachers in using screencast and wikis

Parameter		Screencasts (number of submissions = 1899)		Wiki (number of submissions = 1074)	
		Use in lesson	Evaluate	Use in lesson	Evaluate
Median	Pre	1	1	1	1
	Post	3	3	3	3
Wilcoxon signed-rank test		$Z = -15.26$ $r = 0.40$ $p < 0.001$	$Z = -13.73$ $r = 0.36$ $p < 0.001$	$Z = -11.59$ $r = 0.30$ $p < 0.001$	$Z = -12.24$ $r = 0.32$ $p < 0.001$

Teachers' competence in use of technology was analyzed using their responses to the Technology Competency Survey. We have used a questionnaire adapted from Technology Proficiency Self-Assessment Survey (Ropp, 1999) and administered it via Moodle pre- and post-program. The survey questions were asked on "selection of technology," "use of technology to design lessons," and "evaluation of artifacts generated by students using technology." The survey utilized a five-scale approach—"I cannot do this," "I need training to this," "I can do this with support of resources such as books/videos," "I can do this independently," and "I can teach this to others".

Cronbach's alpha of 0.83 showed that the survey was reliable. To check the validity of survey we did an exploratory factor analysis using PCA with varimax rotation. The factor analysis had resulted in 2 factors with four elements loading onto each with values greater than 0.6, which is sufficient to ensure validity. We then performed a Wilcoxon signed-rank test on the pre- and post-survey data to test whether results are significant.

The results for perception survey and the assignment submissions for screencast and wiki are shown in Table 4.4. As seen, the median has increased from 1 (Need training) to 3 (can do individually) with a medium effect size in both use and evaluation within lesson. This shows that the ET4ET program training resulted in a statistically significant improvement in participants' perception of competence of integrating technology in their own lesson.

4.5.3 Teachers' Reported Practice

The third research question (RQ3) is answered using both post-workshop lesson planning activity and the self-reported practice by the participants at the end of a semester. We have taken the case of wiki as an example technology to explain the results. In an initial survey, before the workshop, 56% of the participants had indicated that they never used wiki in lesson planning.

The first data source comprised lesson plan submissions at the end of wiki activity. There were a total of 1074 submissions, out of which we used purposive

sampling to shortlist 554 submissions of participants who had submitted all the assignments during the workshop. A random sampling was done then to select 85 participants' (15%) wiki implementation plan for analysis. Each lesson plan was evaluated using a rubric containing three criteria for technology integration: C1—matching learning objective with wiki affordances; C2—aligning use of wiki affordances for instructional strategy; and C3—appropriate assessment strategies based on wiki affordances to measure learning objectives. Each criterion contained descriptions at four performance levels (scale of 0–3). The criteria of evaluation were the alignment of the use of technology with the intended learning objectives for the task, instructional strategy adopted, and assessment strategy defined. The rubric was used by iteratively modified through discussions of two independent raters till it led to good agreement for all criteria. The reliability scores (Cohen's κ) for each of the criteria were found to be $\kappa = 0.85$ for C1, $\kappa = 0.85$ for C2, and $\kappa = 0.797$ for C3, indicating high reliability.

The second data source was a survey on reported practice which was administered using Moodle at the end of a semester of instruction (3 months after ET4ET workshop concluded). Seventy-one participants had responded to this survey. There were four questions related to use of wiki within their teaching–learning practice.

Additionally, we solicited open-ended responses by asking, “*Overall what changes do you feel in your teaching in this semester after attending the Pedagogy Workshop?*”. A thematic analysis of the responses was performed (Braun & Clarke, 2006), wherein two researchers had used a deductive approach based on the existing literature on different levels of program effectiveness (Steinert et al., 2006). Two rounds of coding by both the researchers generated common themes related to changes observed at student level, teacher level, and institution level. The analysis of lesson plans using wikis showed the following results (Table 4.5).

The semester-end responses on the survey showed that nearly 30% of the participants attempted to design wiki-based activities for their course. The major purpose for which participants used wikis was for: uploading course notes/resources (76%), conducting and documenting classroom discussions (52.38%), and conducting project discussions (19%). Among the non-users, a major reason cited for not using wikis in their course was their own evaluation that wiki-based activities are not suitable for

Table 4.5 Evaluation of teachers' wiki plan

Criteria	Mean score (out of 3)	SD
Matching learning objectives with wiki affordances	2	0.85
Aligning use of wiki affordances for instructional strategy	1.80	0.82
Appropriate assessment strategies based on wiki affordances to measure learning objectives	1.17	0.72

their course (25%) and lack of Internet access to their students (23%). Only a few (6%) had cited lack of knowledge as a reason for not applying wikis in own course.

In the thematic analysis of open-ended responses on the levels of program effectiveness, two researchers initially generated codes for each individual response and discussed these codes further to combine the codes to a set of relevant common themes. They subsequently did another round of discussion to refine and generate three broad common themes. The first theme of interest is the change observed at student level. Most respondents felt increased engagement of the students and its effect on the student learning. This is best highlighted by the comment *“I was able to engage the backbenchers with the activities and that was reflected in their exam results.”* The teachers also felt that applying workshop learning has facilitated better learning attitudes and beliefs from students, as seen from the comment *“students are more aware about what is being taught for what purpose.”*

The second theme, change at the teacher level, indicated shifts in beliefs and attitudes, and practice. The attitude shift from a teacher-centric or content-oriented approach to a more student-centric or learning-oriented approach was seen in comments like *“[I was] thinking from a student perspective rather than a teacher perspective”*. Some participants indicated improvement in self-belief: *“I feel I can handle the class with more confidence”* and *“... able to apply learnt practices.”* They also feel that their practices have improved to make classes more interactive: *“In each class I am successful in grabbing the attention of students by making them involved in one or the other activity.”* There was a comment on the evaluation activity: *“[Question] Paper setting is improved after attending the workshop.”* The comment *“... ICT enabled teaching methodology will be fruitful in future if we follow it regularly”* brings out the need to sustain these practices to bring about positive changes.

Within the third theme, change at the institution level, two teachers clearly indicated the explicit effort made by them to disseminate the learning from workshop: *“we also conducted a training program for about 120 faculty members out of 350 in our College and shared the important topics of this workshop.”* This teacher indicated their plan to sustain this effort—*“We have also planned to conduct another phase of this workshop in the near future.”*

From the lesson plan scores and reported practices, it is seen that participants have primarily used wikis as they had planned (i.e., for course repository or for classroom discussions). Participants fared better in identifying the learning objectives that wiki affordances provide, compared to the assessment strategies that will be used for evaluating these learning objectives. The low percentage of actual use can be primarily attributed to the self-evaluation of non-suitability and lack of Internet access to students. This shows that teachers had positively thought about the use of wiki in their own course. The open-ended responses from reported practice reiterate the finding that teachers have shifted toward student-centered practices (RQ1).

4.6 Discussion and Conclusion

The A2I2 model provides a framework to design teacher professional development programs on technology integration for student-centered learning. The model recommends both the choice and the organization of the content of such professional development programs, as well as the format of activities to be conducted in the program. We designed a training program, ET4ET, based on the A2I2 model. The evaluation of ET4ET indicates that teachers have learnt and intend to apply student-centered practices such as Think-Pair-Share (RQ1) in their teaching. Their lesson plans and reported practice show that they have become competent in use and integration of technology (RQ3). Further, three months after the workshop, teachers reported positive experiences in their integration of technology, resulting in changes at student level, teacher level, and institution level (RQ3).

We believe that the key features of the of the A2I2 model led to the successful design and implementation of the ET4ET program. The principles of immersivity and pertinency ensured that teachers' engagement was high during the program and led to higher intent to apply the learnings of the program. Constructive alignment, as prescribed by A2I2, was used throughout the program in its choice of topics, activities, and sequence, and participants learnt to constructively align their own teaching practice as well. The role of the investigate phase of the A2I2 model was important in promoting sustainability of such programs. The investigate phase guided the teachers in performing action research on their own practices of technology integration for student-centered learning, via systematic efforts of design, planning, implementation, evaluation, and reflection. These efforts engaged teachers beyond the duration of the professional development program and provided them with relevant goals wherein they applied the learnings of the program. This helped teachers not only improve their practice, but ultimately propelled them toward the scholarship of learning and teaching.

This chapter illustrated the implementation of the A2I2 model for one specific teacher professional development program: ET4ET, a 4-week blended program focusing on a variety of technologies and instructional strategies. The A2I2 model can be adapted to various scenarios with different modes of instruction, different duration, and different choice of technology or pedagogical strategies. We have previously used A2I2 to design a 1-week workshop in a face-to-face mode (Warriem, Murthy, & Iyer, 2013). In case of different instructional modes, the format of the activities had to be adapted to be suitable for the respective mode of instruction. If the A2I2 model needs to be used for a shorter duration, fewer technologies or instructional strategies should be chosen. If the duration is longer, more number of technologies and instructional strategies can be included. The additional technologies and instructional strategies should be such that they can be integrated well with the existing content in the program. In addition, more time should be allotted to the integrate and investigate phases. Regardless of the duration of the workshop, the Attain-Align-Integrate-Investigate cycle should be maintained, and the session on learning objectives should be always included toward the

beginning. For newer or additional technologies, immersivity needs to be maintained. For newer or additional instructional strategies, the active learning nature of the strategy should be ensured. Participants should experience these strategies (as learners) at both individual and collaborative levels and should create materials for their own courses (as teachers) during the integrate phase.

Below are some more recommendations from our implementation that may benefit others who may wish to apply this model:

- The student-centered teaching–learning strategies and technology integration techniques should be illustrated via examples in the domains familiar to the participants. Unless they can relate to the examples, they find it hard to apply it to their own context.
- For each technology being introduced, it is necessary to first equip participants with the skills to use the technology to bring out its pedagogical affordances in their relevant context before explaining its details. Similarly, for each instructional strategy being introduced, it is necessary to first implement the strategy as an activity that participants perform, before discussing the detailed process of the strategy.
- Participants need to experience (as a learner) the active learning nature of instructional strategies first. Then, they can design activities for their own context (as a teacher) using these strategies. This implies that the training program must be conducted using active learning techniques, regardless of the specific content included.

In summary, this chapter described the basis and features of the A2I2 model to design teacher professional development programs with the goal of technology integration for student-centered learning. The professional development program we implemented based on the A2I2 model enabled teachers to move toward effective technology integration and more student-centered practices. While we have not yet directly measured student performance, changes in teaching practice and teachers' inquiry on the change indicate potential for improvement in student learning. We also saw evidence of changes at student level, teacher level, and institution level a few months after the program, indicating sustainability beyond the duration of the program. To conclude, we acknowledge the supportive role played by our institution, which is the hub for conducting such training programs for several engineering colleges across the country as part of the Indian government's National Mission on Education through ICT. Thus, both institution and government are playing a vital role in promoting SoLT activities within India.

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Chapter 5

Development of an Effective Staff Professional Development for the Enhancement of Student Learning

May Sok-Ching Chan and Siu Cheung Kong

Abstract Higher education institutions around the world have increasingly been concerned with staff professional development (SPD) programmes for academic and teaching (A/T) staff. Since its establishment in 1994, an education university in Hong Kong (which we will refer to as the University) has offered primarily teacher education to foster the development of quality teachers. To meet the demand for students' holistic and whole-person development for the twenty-first century, the University has sought to broaden the range of programmes offered, introducing the concept of 'Education-Plus'. Under the 'Education-Plus' vision, the University has been expanding non-education programmes rapidly since 2010. Many new A/T staff with limited teaching experience have been recruited, needing professional development (PD) to enhance their skills and knowledge. Since 2013, the Centre for Learning, Teaching and Technology (LTTTC) has designed and developed an SPD programme to allow A/T staff to enrich their PD and ultimately enhance student learning. The evaluation of the current SPD programme activities revealed that the PD activities were beneficial to A/T's teaching and their PD, but the question has arisen as to whether the current SPD programme is effective, e.g. whether A/T staff have obtained and applied new knowledge and skills to teaching. This paper will discuss the design of the current SPD programme and analyze its activities. The design outlined in 'Three Stages of Professional Development: The Cycle of Change' (Bellanca, 2009) will be referred to in order to develop an

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effective SPD programme. The paper will also design and propose a framework to evaluate the effectiveness of the SPD programme and its implementation cycle.

Keywords Staff professional development · Staff induction · Higher education

5.1 Introduction

For more than ten years, the higher education sector has highlighted the need for PD programmes. The sector has also been concerned with high-quality PD as a central component for the improvement of education at tertiary institutions (Guskey, 2002). Indeed, the establishment and implementation of SPD programmes for A/T staff have been of increasing concern among higher education institutions around the world, since SPD is a significant mechanism for developing and enhancing learning and teaching in higher education. On the other hand, research findings related to teachers' perspectives of success showed that most teachers considered their success depending on their students' behaviours and activities (Fullen, 1999; Fullan & Hargreaves, 1996; Harootunian & Yargar, 1980). Similarly, Guskey (2002) pointed out that teachers usually considered that 'becoming a better teacher means enhancing student learning outcomes' (p. 382), and high-quality teachers can impact student learning substantially (Strong, 2009). Furthermore, teaching at the tertiary education level is increasingly demanding, as students are expected to learn not only subject disciplines, but also more general skills, such as problem-solving, communication and global perspectives. The literature suggests that teaching quality and a successful SPD programme can improve student learning outcomes. Therefore, provision of PD for A/T staff is essential to the institutions.

The framework of scholarship of learning and teaching (SoLT), discussed in Chap. 1, mentioned that in order to improve student learning, A/T staff should be engaged in SoLT. The University should play an important role in supporting A/T staff's engagement, including providing PD opportunities to A/T staff. Therefore, offering a SPD programme is essential to the University's successful implementation of SoLT and enhancement of A/T staff's PD, e.g. improving their teaching skills and strategies and ultimately enlightening student learning outcomes.

5.1.1 *Why Did Current Peer Support Provision Need to Change?*

Mentoring and peer support is a crucial component of SPD programme by which A/T staff improve their teaching through knowledge- and experience-sharing. Research has shown that mentoring is a dynamic system of advice and support for ongoing and training and development (Robins, 2006), serving as an important and

essential activity to contribute to A/T staff's PD and to improve the effectiveness of teaching activities (Bozak, Yildirim, & Demirtas, 2011). Peer observation of teaching was one of the key activities related to teacher development (Bell, 2005; Bell & Mladenovic, 2008; Lomas & Nicholls, 2005; Siddiqui, Jonas-Dwyer, & Carr, 2007). Peer observation enabled A/T staff to share their knowledge and experiences and facilitate reflection on their own teaching practice (Donnelly, 2007). A study of performance of two groups of new teachers showed that teachers who received support from trained mentors had higher ratings on classroom activities that met students' interests and kept students on task (Wang, Strong, & Odell, 2004). Moreover, experienced teachers generally agreed that classroom performance was a better way to evaluate quality teaching (Strong, 2009). As mentoring and peer support offers the opportunity for A/T staff to share and learn from each other, and to reflect on their own teaching for improvement, it is therefore an essential component of an SPD programme.

On the other hand, the University, since its establishment in 1994, has primarily offered teacher education to foster quality teachers, including pre-service and existing school teachers for Hong Kong society. Its A/T staff were mainly former secondary and primary school teachers equipped with a rich variety of teaching experiences in school settings. A/T staff belong to or are affiliated with 16 academic departments and the Centre for Language in Education (CLE) at the University, and one of their key duties is to teach pre-service teachers. According to the current practices, a variety of peer support activities are provided for new A/T staff, spread among different academic departments and the CLE. On the other hand, the results obtained from a survey of Peer Support of Teaching Scheme showed that there were a few common activities of peer support that many departments offered to newcomers. These common activities included (1) assigning an experienced colleague or a Teaching Awardee as a mentor to a new A/T staff member in the post of assistant professor or below, and (2) encouraging new colleagues to participate in peer observation of teaching activities, e.g. either inviting his/her mentor to observe his/her classroom teaching or observing his/her mentor's teaching. Some departments did not set up a mentor-mentee pairing system; instead, they encouraged new colleagues to observe experienced colleagues' or Teaching Awardees' teaching or to invite these colleagues to observe their teaching, or the departments asked new colleagues to seek advice on learning and teaching from experienced colleagues when they encountered teaching difficulties. However, the provision of peer support in the University was neither well organized nor systematic, as the University still did not have a consistent peer support mechanism for new A/T staff.

Moreover, to meet the demand for students' holistic and whole-person development for the twenty-first century, the University sought to broaden the range of programmes offered to transform and reach a multidisciplinary university, developing the 'Education-Plus' concept as a result (The Hong Kong Institute of Education, 2009). Under the 'Education-Plus' vision, the University has expanded its non-education programmes rapidly since 2010, and a number of new A/T staff with limited teaching experience were recruited. There is, therefore, a need to prepare new A/T staff to teach in a higher education environment. Research suggests

that professional development should be ongoing and systematic (Tournaki, Lyublinskaya, & Carolan, 2011) and should aim at increasing individual's knowledge and skills in order to enhance student learning outcomes (Birman, Desimone, Porter, & Garet 2000; Bubb, 2004; Guskey, 2000; Killions, 2008). The more opportunities to participate in high-quality professional development, the more likely it is that the institution will affect students' achievements positively (Tournaki et al., 2011). Similarly, in Murray and Male's (2005) study of the challenges new teacher educators faced when transferring from school to higher education, interviewees emphasized that it was important for them to develop new pedagogical knowledge when they started teaching in higher education. Furthermore, experienced A/T staff also must have access to continuous PD. As Wood et al. (2011), in their study of types of professional development provided for mathematics teachers and of their preference for delivery modes, observed that it was assumed that (mathematics) teachers employed should have sufficient subject (mathematics) knowledge for their teaching, but it was not sure whether they have sufficient knowledge of learning and teaching. Meanwhile, student populations in primary and secondary schools are increasingly diverse. To meet schools' changing needs, it is very important to equip and prepare the University's students to meet the challenges of higher education. Indeed, to best prepare our students, A/T staff must also equip themselves with and enhance their teaching skills and pedagogical knowledge. In addition, in order to implement SoTL in the University successfully, an SPD programme for the enhancement of learning and teaching was developed and has been implemented since 2013.

5.1.2 Why Is the Development of an Effective SPD Programme Needed?

One objective of offering a SPD programme is to improve teaching. The SPD activities offered from 2013 to 2015 generally included sharing seminars on good teaching practices, presentations on the design, implementation and outcomes of funding projects focusing on the improvement of student learning and peer observations of teaching. Analysis of the evaluation of these SPD activities showed that on average, more than 90% of participants considered the activities to be helpful to their future teaching and inspired them to think about directions and approaches of teaching in the previous two academic years (refer to Table 5.1). At the same time, evaluation of SPD activities was based on the participants' experiences and perspectives on the activities only, and the impact of their PD (e.g. change or improvement of teaching and the enhancement of student learning) could not be evaluated. On the other hand, a key piece of feedback from the senior management on the report on SPD programme was that information of the effectiveness of SPD programme was deficient. To respond to this feedback, first the meaning of 'effective' for an SPD programme must be examined. An effective SPD programme should be ongoing, coherent and linked to student achievement (Killions, 2008). As Bellanca (2009) suggested, change best occurred when

Table 5.1 Summary of results collected in 2013–2014 and in 2014–2015

Year	2013–2014	2014–2015	Total/average
Number of activities held	43	59	102 (T)
Number of participants	406	516	922 (T)
Response rate of evaluation form	75.3%	72.3%	73.6% (A)
Core questions on evaluation form			
(Activity) was worth attending.	93.7%	94.4%	94.1% (A)
(Activity) was helpful to my future teaching/inspired me to think about directions and approaches of teaching.	86.8%	95.0%	90.1% (A)
(Activity) provided me some insights into my current teaching.	100%	90.4%	91.5% (A)
(Activity) motivated me to explore technologies for teaching and learning	97.8%	96.4%	97.1% (A)
(Activity) helped enhance my professional development.	100%	89.2%	90.1% (A)
(Activity) enhanced my knowledge in using technology for teaching and learning	100%	94.8%	97.3% (A)
(Activity) provided me the ideas/helped me to understand better about (the content of the activity)	83.8%	94.6%	90.5% (A)

teachers integrate new knowledge or skills into classroom lessons, and when learners focused on how they would actually improve their instruction by converting static information into action. An effective SPD programme should provide not only teaching knowledge or skills to the A/T staff, but also support for them as they transfer what they have learned to the classroom, for the enhancement of student learning. This transfer of new knowledge/skills is considered a successful ‘change’. Accordingly, an effective SPD programme should facilitate the improvement of A/T staff teaching and heighten student learning.

Questions have since arisen about what effect the current SPD programme had on A/T staff’s current and future teaching? Can A/T staff’s capacities be strengthened and, consequently, can students’ learning outcomes be enhanced? Most importantly, how can the University’s SPD programme work most effectively?

To respond to these queries, this chapter will discuss the current SPD programme and analyze its activities. In order to evaluate the overall effectiveness of the SPD programme, the ‘effectiveness’ of an SPD programme as defined by Bellanca (2009) in ‘Three Stages of Professional Development: The Cycle of Change’ will be referred. An effective SPD programme, including a method of evaluation an implementation cycle, will be developed and proposed. The following questions will then be addressed:

1. What is the evaluation mechanism of the current SPD programme offered, and what are the results of the evaluation?
2. How can the current SPD programme be improved in order to strengthen academic/teaching staff’s teaching and to help enhance student learning outcomes?
3. What is an effective SPD programme and how can its effectiveness be measured in future?

5.2 Establishment of the Staff Professional Development Programme

As mentioned in the previous section, following the development of 'Education-Plus' at the University, since 2010 a number of novice professors have been employed every year, and some of whom have one year or less of teaching experience in higher education. Therefore, professional training for this group of staff is necessary.

Furthermore, mentoring and peer support is a vital component of the SPD programme for A/T staff to improve their teaching through knowledge- and experience-sharing and reflective teaching. The programme offered opportunities to A/T staff, especially new colleagues, to observe other experienced colleagues' good teaching, to obtain feedback and reflect on their teaching for improvement.

Because PD should be ongoing and sustainable (Blandford, 2000), the University needs to offer a systematic and appropriate professional training for new and existing A/T staff. The first Staff Professional Development programme was designed and developed by LTTTC, and in August 2013, the programme was offered to new and existing A/T staff for developing and enhancing their capacities in higher education teaching. The SPD programme consisted of three components:

- Staff Induction Programme for all new full-time A/T staff,
- Ongoing PD Programme for all A/T staff and
- Mentoring and Peer Coaching System.

The Induction Programme was composed of an Orientation Session and two courses: Course One, Teaching and Learning in Higher Education, and Course Two, Using Technologies (Moodle, Turnitin and Mahara) in Higher Education. All new full-time A/T staff were invited to participate in the Induction Programme. Orientation Session was a 3-h programme providing basic information on learning, teaching and assessment at the University, and introducing learning and teaching support that A/T staff could get for their teaching. Experienced A/T colleagues shared their teaching experiences, skills and tips with participants in the 3-h Course One. Participants learned Learning Management Systems provided and supported by the University, such as Moodle, Turnitin and Mahara, and experienced hands-on practices in the 3-h Course Two. Activities of Ongoing PD were organized, including invited talks by experienced A/T colleagues and Teaching Awardees from the University and other local universities, sharing sessions on funding project conduction and e-Learning and blended learning workshops.

Indeed, peer observation of teaching was one of the common activities practiced in many academic departments at the University, although in past years the provision of peer support activities has varied and depended on individual departments' arrangements. Colleagues at the University usually invited experienced or senior colleagues from the same department to observe their teaching. To improve and enhance peer support, a supportive and collegial framework of peer support was suggested to review and reflect on teaching practices as well as to share good

and innovative practices. A Peer Support of Teaching Scheme was developed and implemented in Semester 2 of 2014–2015. Colleagues could invite colleagues from the same department but were encouraged to invite Teaching Awardees from other departments to observe and evaluate their classroom teaching to further enhance and improve their teaching.

5.2.1 Evaluation Mechanism of the Current SPD Programme

In order to develop an appropriate SPD programme for A/T staff, the University has continued to refine and modify the current SPD programme through evaluation. Thus, a quality assurance mechanism for evaluating and improving the SPD programme is essential. Moreover, it is necessary to evaluate the programme at different stages, because such information will help identify needs at different levels, and investigate the effectiveness and appropriateness of the programme (Baker & Sharpe, 1992). According to Baker and Sharpe's (1992) suggestion, three stages were developed to evaluate a professional development programme: (1) needs identification at the developing stage; (2) on-course monitoring and end-of-course evaluation at the progress stage; and (3) post-course evaluation at the reporting and measure of outcomes stage.

To identify A/T staff's needs, when the programme was being developed, the proposal of SPD programme had been considered and discussed by A/T colleagues at different levels of learning and teaching committees, e.g. the Learning and Teaching Quality Committee at the University level, and Departmental Learning and Teaching Committees at the departmental level. After confirming and endorsing the proposed programme, a new SPD programme was first implemented in August 2013. To evaluate and improve the programme, three participants were interviewed to collect their feedback and views on the first Induction Programme. In addition, in order to meet A/T staff's needs and develop future activities, an email survey was conducted to collect views on expected activities for the Ongoing PD Programme.

At the on-course monitoring and end-of-course stages, a survey evaluating PD activities was an essential component of developing a comprehensive quality assurance mechanism. An evaluation form was designed and implemented for each activity. To provide appropriate SPD programme and improve activities in future, the form included some questions regarding the impact on A/T staff's teaching and their professional development; some questions regarding administrative arrangement, e.g. the most popular timeslots and topics; and some code questions to apply to all questionnaires.

In addition, a Survey of Peer Support of Teaching was designed to collect information about participation in peer support activities from each academic department and the CLE at the end of academic year. Feedback from Teaching Awardees was also collected after the implementation of the Peer Support of Teaching Scheme in order to improve this scheme in future.

5.2.2 Analysis of the Evaluation of SPD Activities

A set of evaluation forms was designed and used to allow PD participants to evaluate PD activities in 2013–2014 and 2014–2015. The evaluation results of PD activities offered in the last two academic years showed that two Induction Programmes were held for all new A/T staff in 2013–2014 and 2014–2015, with 41 and 73 attendees, respectively. A total of 41 and 57 ongoing PD activities, including sharing seminars and workshops, were organized in 2013–2014 and 2014–2015, respectively; 365 and 443 participants attended these activities, respectively. Analysis of the evaluation from both academic years is shown below.

The analysis of evaluations of these activities in the past two academic years revealed that on average, 94.1% of respondents agreed and strongly agreed that an activity was worth attending. Around 92% of respondents agreed that the activities they attended provided some insights into their current teaching practice, while more than 90% of them found that activities were helpful to their future teaching and enhanced their continuing professional development. About 97% agreed that they were motivated to explore technologies for future teaching and learning (refer to Table 5.1). Some encouraging comments such as ‘very good, organized and inspiring’ and ‘the hands-on section is very useful’ were also received. Moreover, participants suggested that they were interested in such future workshops as ‘How to make history classes more interesting for students’, ‘Seminars/workshops about activities usable in classes that strengthen relationship between the teacher and students’, ‘How to motivate students to participate in the learning and teaching activities’, ‘Designing lectures in attractive ways’. The results from the evaluation of SPD activities were quite promising.

5.2.3 Discussion of Evaluation Results

5.2.3.1 The Provision of SPD Programme was Appropriate

The results of evaluation showed that on average, more than 90% of participants expressed that the activities of the SPD programmes were worth attending, helpful to their future teaching and applicable to their current teaching (refer to Table 5.1). This result was in line with a study evaluating a professional development programme for a multidisciplinary science subject, in which the participating teachers positively evaluated the professional development programme designed to assist and support teachers before, during and after implementation of a science module (Visser, Coenders, Terlouw, & Pieters, 2013). Another similar result, from a study of the effect of a faculty professional development programme to enhance the knowledge level of University teachers in Pakistan, found a positive effect of the professional development training courses on the participants’ knowledge and skills, because the scores of the participants were higher on the post-test of the Higher Education Commission test, as compared to that of the pre-test (Saleem,

Masrur, & Afzal, 2014). These findings suggest that these SPD programme activities were appropriate and successful, and that they were supported by A/T staff who found the SPD programme beneficial to their teaching and professional development during the previous two years.

5.2.3.2 Feedback from Evaluation Served as Good Indicators for Future Improvement

Key comments collected from evaluations suggested that sharing colleagues' teaching practices and applying technologies to teaching were the most desired activities. These results and comments indicated ways to improve and enhance the SPD programme in future. For example, after referring to the feedback collected from the evaluation of SPD activities held in 2013–2014, the SPD programme was refined and modified accordingly. Moreover, a new series of Hong Kong Higher Education Teaching Awardees/Experienced Academics' Experience-Sharing Seminars and Workshops was arranged. Colleagues from other local universities were invited to conduct seminars and/or workshops to share their valuable teaching experiences with colleagues at the University. Blended learning activities were also popular in 2013–2014; therefore, this kind of activity was organized continuously. On the other hand, as shown in Table 5.1, the increase in percentages of the summary of the results in 2013–2014 and 2014–2015 revealed that more respondents in 2014–2015 considered the activities to be worth attending and helpful to their future teaching, as compared to those in 2013–2014. The addition of sharing seminars/workshops, led by Teaching Awardees from other local universities, had a positive impact on the SPD programme. This result was in line with Ruegg's (2015) research findings that repeated teacher feedback could be effective in Japanese university students' efforts to improve their English grammar and writing, as well as in line with the finding that receiving feedback had the potential to boost the quality of the actual writing product (Gielen & DeWever, 2015). Therefore, evaluation was essential to developing an effective SPD programme, as the results of evaluation served as strong indicators for future improvement.

5.3 Improvement of the Current SPD Programme

5.3.1 What Did the Current SPD Programme Miss?

Although the results of PD activity evaluation suggested that the current SPD programme was helpful to A/T staff, information regarding the overall effectiveness of the programme is still missing. As mentioned in the Induction section, an effective SPD programme, according to Bellanca (2009), should stimulate A/T staff to change or improve their teaching and should support them in transferring what they have learned from the programme to the classroom, in order to enhance student

learning. Simply put, an effective SPD programme should include two key components: (1) acquisition of new knowledge and/or skills by the participants and (2) transformation of such knowledge and/or skills into classroom lessons for the enhancement of student learning.

Data in Table 5.1 showed that the SPD programmes served a total of 922 A/T participants and, on average, more than 97% of responses considered the activities of SPD Programmes to have enhanced their knowledge in using technology for teaching and learning. More than 90% agreed that (activity) provided helped them to better understand the content of the activity during the previous two years. These results showed that the SPD programme had provided knowledge and skills for improving A/T staff teaching and suggested that the current SPD programme had met one of the requirements for an effective SPD programme as suggested by Bellanca (2009)—that is, the ‘acquirement of new knowledge and/or skills by the participants’.

To achieve another requirement for an effective SPD programme, transformation of new knowledge and/or skills needs to be considered, and student learning outcomes need to be measured. Baker and Sharpe (1992) proposed considering measurement of outcomes as part of a post-course stage of further refinement and improvement of the PD programme. Research also suggests that an effective SPD programme should focus on how students learned subject matter content (Desimone, Porter, Garet, Suk Koon, & Birman, 2002; Desimone, Smith, & Philips, 2007; McLaughlin & Talbert, 2001), and the US has used standardized test scores in schools to measure student learning outcomes during the past fifteen years, and the results of student learning outcomes were an added value to measure teacher effectiveness (Strong, 2009). These findings suggest that student learning outcomes should be used to measure the effectiveness of A/T’s staff’s teaching (Guskey, 2002). To understand whether new knowledge and skills are transferred to students successfully, we need to examine ‘how much student can learn’ and/or ‘how student learning can be improved’. Thus, an effective SPD programme should include the evaluation of student learning outcomes.

Nonetheless, student learning outcomes cannot be examined by participating in a single Induction day and/or one-shot seminar, workshop or sharing session. They can only be assessed when an A/T staff makes a change, transferring information gathered from the SPD programme to classroom practice over a period of time. At least a semester is needed to implement this change process and, consequently, to collect student learning outcomes. Therefore, measures of student learning outcomes are a vital component to evaluating a PD programme, and an effective SPD programme should be continuing and prolonged so as to include measurement of student learning outcomes.

5.4 Development of an Effective SPD Programme

5.4.1 Stage One—A Certificate Course

An effective SPD programme for A/T staff must address new knowledge and/or skills for enhancing A/T’s PD and measuring student learning outcomes. Thus,

three programme objectives: (a) providing new knowledge and/or skills for the enhancement of A/T staff's professional development, (b) evaluating student learning outcomes and (c) ensuring continuous programme improvement through ongoing development and evaluation are proposed. These objectives will be met over two stages. In the first stage, a well-structured and comprehensive SPD programme will be designed and developed for new A/T staff, and in the second stage, a framework of effective SPD, including evaluating student learning outcomes and timelines for implementation, will be developed for all A/T staff. This programme aims to enable all A/T staff to obtain holistic professional training and manage the changes (e.g. application of new knowledge and/or skills to classroom teaching) that will improve their teaching and enhance student learning.

Therefore, a certificate course, 'Introduction to Teaching in Higher Education', was developed by refining and modifying the SPD programme run in 2013–2014 and 2014–2015 to better equip new A/T staff with essential knowledge and skills in teaching in higher education and to enable them to become competent A/T staff members of the University. This certificate course, which commenced in September 2015, is composed of four themes: (i) Staff Induction Programme—a 6 h programme providing basic information related to learning, teaching and assessment at the University (e.g. policy of learning, teaching and assessment, learning and teaching support and student academic backgrounds); (ii) Practicum—a minimum of 3 h of practicum activities regarding new A/T staff's teaching practices; (iii) Seminars/Workshops in Learning and Teaching—a minimum of 1.5 h' attendance in seminars, workshops or sessions on experience sharing of good teaching and research; and (iv) Learning and Teaching Support—a minimum of 1.5 h of workshops with library-related and/or technology-related skills and practices for the development of staff's scholarship of teaching and innovative teaching. New A/T staff are required to complete these four themes, attending a minimum of 12 h of activities for the certificate course. After the completion of this Course, A/T staff are expected to be able to make changes and apply such changes to the classroom teaching.

5.4.2 Stage Two—An Effective and Sustainable SPD Programme

After developing a holistic SPD programme certificate course for new A/T staff, an effective and sustainable SPD programme will be designed and developed in the second stage. For the purpose of supporting A/T staff in transferring knowledge/skills to the classroom and measuring student learning, Bellanca's (2009) model of 'Three Stages of Professional Development: The Cycle of Change' is referred. Bellanca's Three Stages of Professional Development includes Stage (1), Innovation; Stage (2), Refinement; and Stage (3), Sustainability. Stage 1 of this model comprises pilot innovation. In this stage, teachers take new ideas about teaching and learning and plan to integrate these ideas into their classroom teaching. Stage 2 is the refinement of practice. Teachers in this stage need to keep track on the

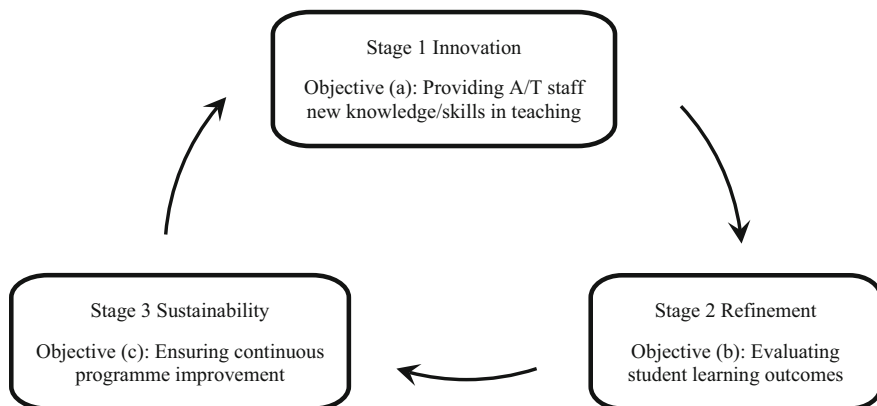


Fig. 5.1 Three objectives of development of an effective SPD programme based on Bellanca's 'three stages of professional development: Cycle of change'

progress of pilot innovation to find out what they are doing well in the pilot and what can do differently for improvement or refinement. Stage 3 is to establish long-term improvement. In this stage, a plan of action is required, one that contains collaborative goals, measurable outcomes, aligned PD strategies, assessment tools and timelines with assessments of integrating innovation. Bellanca's Three Stages of Professional Development Cycle is relevant and aligned with the three objectives of an effective SPD programme and should be to enrich the current SPD programme—certificate course (refer to Fig. 5.1).

Patterned after Bellanca's Professional Development Cycle, the proposed model for an effective SPD programme for the University also consists of three stages, but the content of three stages will vary slightly based on the learning, teaching and assessment practices of the University. The three stages of the effective SPD programme are suggested as follows.

Stage 1 is *New Knowledge/Skills in Innovative Teaching*. This stage aims to obtain new knowledge and/or skills through the certificate course, such as the Induction Programme for new A/T staff, seminars/workshops in learning and teaching, and workshops regarding library-related and technology-related skills and practices for all A/T staff. A/T staff will then plan and design what new knowledge/skills, e.g. flipped classroom, peer assessment and mobile learning, can be applied to classroom teaching to improve student learning.

Stage 2 will be *Testing/Refining to Enhance Student Learning*, and this stage will apply innovative teaching, e.g. flipped classroom, peer assessment and mobile learning, by integration of new knowledge and/or skills into classroom teaching. In Stage 2, A/T staff obtain comments on innovative teaching through peer observation in the Practicum and/or Peer Support of Teaching Scheme for review and reflection, in order to further refine and improve teaching practices. A/T staff may need to further adjust and retest innovative teaching techniques after a trial of one or two lessons.

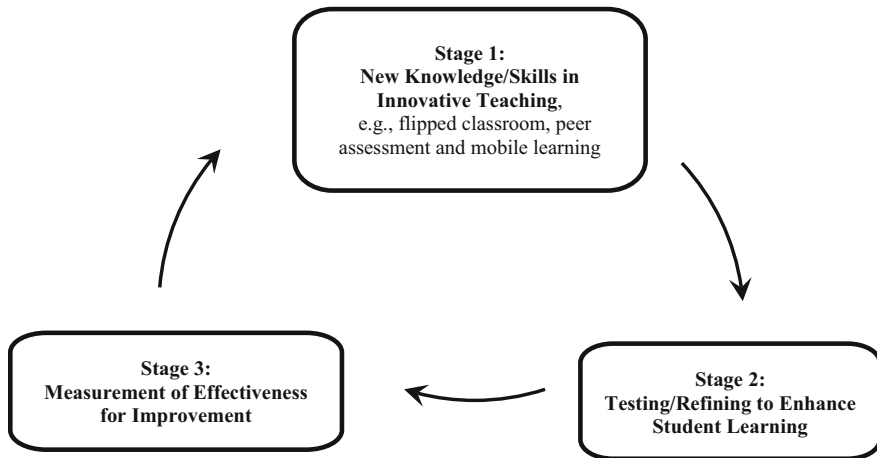


Fig. 5.2 Three-stage development of an ‘effective’ SPD programme at the University

Stage 3 *Measurement of Effectiveness for Improvement* involves measuring the effectiveness of innovative teaching applied to the classroom teaching through the evaluation of student learning outcomes. This stage involves evaluating the innovative teaching by assessing students’ course work, student’ feedback on innovative teaching and student e-portfolios with evidences and by assessing teacher performance through Student Evaluation of Teaching (SET) and Degree Programme Evaluations by students. The three-stage development of an effective SPD programme at the University is presented in Fig. 5.2.

5.4.3 Implementation Cycle of an Effective SPD Programme

Because A/T staff members need time to plan and design innovative teaching after acquiring new knowledge/skills from the SPD programme, moving through Stage 1 within a semester is suggested. Testing an innovative strategy or skill in the classroom usually spans a few lessons or whole course. In addition, staff may need one or two lessons to continue to refine innovative teaching, after which the revised innovative strategies and skills will be applied again; therefore, Stage 2 should be implemented in the same semester of Stage 1. At the end of a course, evaluation data of student learning outcomes (e.g. assignment, presentation and field experience) and teacher performance (e.g. scores of SET and feedback from peers on observation of classroom teaching) will be collected for analysis, reflection and reporting, if appropriate as Stage 3. It will take a semester to complete this stage. To end an implementation cycle, a report or reflection will analyze data and make suggestions/comments for improvement. These suggestions/comments will be considered and possibly applied at the start of next implementation cycle. The loop

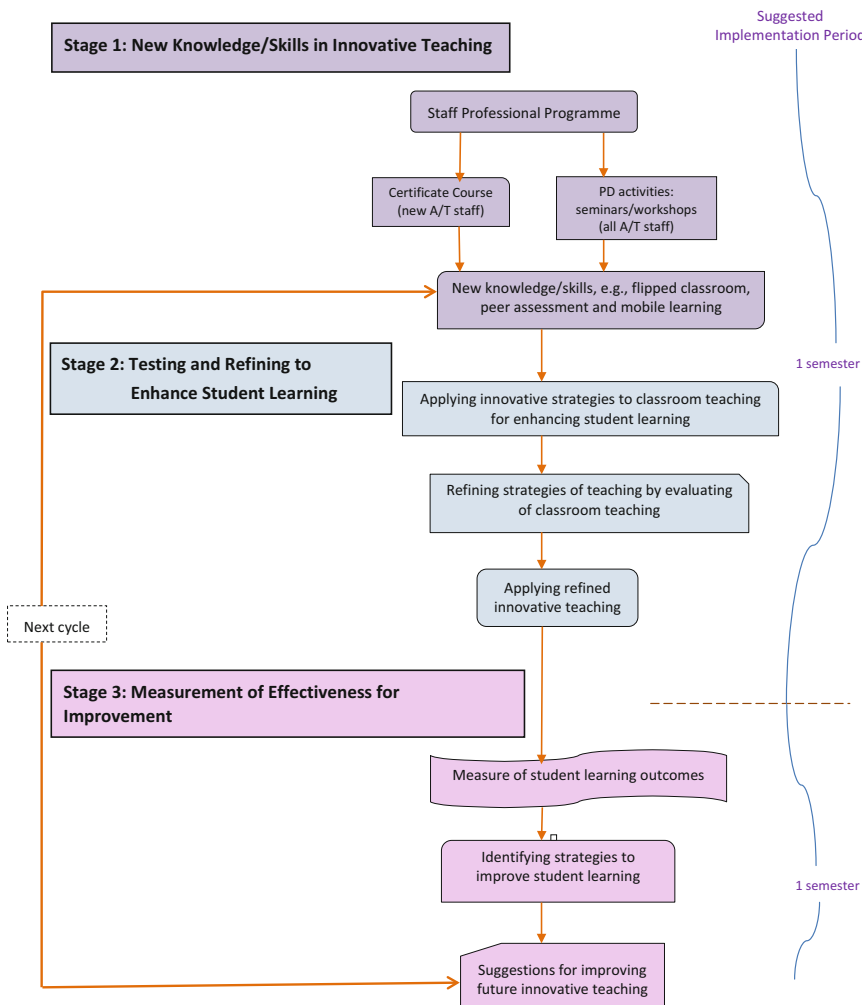


Fig. 5.3 Framework of the implementation cycle of an effective SPD programme

of the implementation cycle will serve as a mechanism for long-term improvement and sustainability of the SPD programme. Therefore, an effective, ongoing and sustainable programme should be implemented in cycles of at least one academic year. Figure 5.3 refers to a framework of the implementation cycle of an effective SPD programme.

5.5 Conclusion

As a whole, the evaluation results of SPD programme activities from 2013 to 2015 have been encouraging. In addition, the University was successful in implementing a quality mechanism to monitor and improve SPD activities provided for A/T staff in the past two years; participants responded that the SPD programme could impact their current and future teaching. Nonetheless, the existing quality mechanism and the implementation period are not sufficient to measure the SPD programme's effectiveness. To evaluate an effective SPD programme, evaluators must show that A/T staff's knowledge and skills can improve student learning outcomes. A period of one academic year is proposed to complete a cycle of evaluation. It is suggested that, to evaluate and refine teaching practices, an improved quality mechanism is needed, along with sustainable feedback from different stakeholders at different stages of implementation. This improved SPD programme will be proposed to the senior management for consideration and is expected to be implemented in the near future.

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Chapter 6

Leveraging Knowledge Through Communities of Practice

Eric Chi-Keung Cheng

Abstract This chapter presents a case study of cultivating communities of practice (CoP) for leveraging knowledge for higher education institutional development. CoPs have been shown to encourage member participation in collaborative learning and to enhance knowledge acquisition from one member to another (Wenger, Ivey Business Journal, 2004). This is a knowledge management tool for capturing organization knowledge. However, to launch a CoP in any organization is difficult, for it cannot be mandated or created, but it can only be coordinated, facilitated, and cultivated (Wenger et al., Cultivating communities of practice: A guide to managing knowledge, 2009). The model of communities of practice is based on the idea that one cannot separate knowledge from practice. Through participation in the CoP's activities, knowledge of CoP members could be captured and codified into tangible capital, and this "making things real" process is called reification. Participation and reification are intertwined and interdependent in cultivating a CoP for leveraging knowledge in organizations.

Keywords Communities of practice • Knowledge management • Participation and reification

6.1 Introduction

Knowledge expansion, government policy, and changing organizational environment altogether create impacts and challenges to any organization. Knowledge on how to perform an organization's goals is a critical issue for the organization's sustainable development. Organizations should formulate effective strategies to retrieve, share, create, and apply knowledge for organization development and to capture and retain knowledge for sustaining their development. These processes could be

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conceptualized as knowledge management processes. The overall approach an organization intends to adopt to manage the knowledge management processes and to align its knowledge resources and capabilities for enhancing organizational performance could be defined as knowledge management (KM) strategy (Zack, 1999). KM strategies can be divided into two categories: codification for knowledge storing and interpersonal interactive knowledge sharing (Hansen, Nohria, & Tierney, 1999; Zack, 1999). Interpersonal interactive knowledge sharing emphasizes the use of dialogue through social networks, including occupational groups and teams, and knowledge can be obtained in this way from experienced and skilled people (Swan, Newell, & Robertson, 2000). In such instances, individuals can provide their insights to the particular person or people in need of them (Snowden, 2002). This enhances shared knowledge through person-to-person contact (Hansen et al., 1999). The strategy attempts to acquire internal and opportunistic knowledge and share it informally (Jordan & Jones, 1997). It involves the knowledge processes of retrieval, sharing, and utilization. KM tools that can be applied for enacting the codification and personalization strategies are critical for KM implementation.

A communities of practice is an interpersonal interactive knowledge-sharing tool that supports knowledge transfer among working professionals. It can bring people together for rigorous conversations that are conducive to knowledge sharing and enable them to make connections with others so as to create powerful learning experiences for them and will lead directly to powerful learning for students (Cheng, 2009). It may not only realize personalization strategies but also help to codify knowledge for storing and using an organization's explicitly documented knowledge. In such instances, individuals strive to explicitly encode their knowledge into a shared knowledge repository, such as a database, and also retrieve knowledge they need, which has been added by other individuals to the repository. A CoP could be applied as a knowledge management tool for leveraging knowledge. However, a CoP cannot be self-created, but requires cultivation and facilitation. Facilitation of the CoP needs to be carried out through balancing participation and reification. This chapter discusses how to apply CoP as a KM tool to manage knowledge in a higher education institute.

6.2 Literature Review

The knowledge-sharing themes reflected in CoP have increasingly grown in popularity among practitioners. The CoP approach has been used by organizational learning approaches in workplace learning (Boud & Middleton, 2003). CoPs are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. The term "community of practice" was first coined by Jean Lave and Etienne Wenger in a research project on social learning for the Institute for Research and Learning in 1990 and subsequently published as a book, *Situated Learning: Legitimate Peripheral Participation* (Lave & Wenger, 1991). They used ethnographic approaches to understand how people

acquired knowledge in informal work settings, by using informal social relationships. “Communities of practice perspective suggests that knowledge construction is relational and dynamic and that learning is an inseparable aspect of social practice. It is to be found in the relationship between people and the context of their activities” (Leshem, 2007, p. 290). “Learning involves engagement in social activities and it is seen as an evolving form of membership” (Lave & Wenger, 1991, p. 53). The knowledge-sharing themes reflected in communities of practice have increasingly grown in popularity among practitioners.

Wenger, McDermott, and Snyder (2002) define communities of practice as “*a group of people who share a concern or passion for something they do and learn how to do it better as they interact regularly*” (p. 4). This implies that three principal characteristics need to be satisfied for a communities to be defined as a communities of practice: joint enterprise, engagement in mutual learning, and shared repertoire of resources. Wenger (1998) argues that only by the development of these three characteristics in parallel does one cultivate a community of practice which allows for co-construction of knowledge. The first characteristic, joint enterprise, provides common ground for communication and a sense of common identity for the members. If the domain is well defined, the purpose and value of the community will be legitimized by the members and the stakeholders. The members know what to contribute and how to participate. Joint enterprise reflects the diverse and complex motivations and personal situations of the teachers involved in those collective practices. The second characteristic, engagement in mutual learning, constitutes a social fabric of learning. If the community is strong and mature, it fosters interactions and relationships based on mutual respect and trust. Members are willing to share ideas, expose one’s own ignorance, ask difficult questions, and listen carefully. CoP is based on, and in, social relationship which is related to collaborative learning activities in small-class teaching among teachers. The third characteristic, shared repertoire of resources, refers to a set of frameworks, ideas, tools, information, and documents that members share. It is the specific knowledge members develop, share, and maintain. It enables members to deal effectively with the domain of knowledge. The products of shared repertoires of resources are not limited to teaching notes and student handouts developed by the teachers, but also extend to the sharing practice that is cultivated by them during their participation. These characteristics create a driving force to the community at different stages of development. When they work together well, the community will produce its own structure which encourages the development and sharing of knowledge.

CoPs have been shown to encourage member participation in collaborative learning and to enhance mutual knowledge acquisition (Wenger, 2004). Previous empirical research indicated that CoPs had significant positive effects on both the process and the outcome of collaborative learning (Holland 2005), as well as a reciprocal relationship with teacher professional development and instructional improvement interventions (Schlager & Fusco, 2004). CoPs could be a prerequisite to designing social learning infrastructure that supports knowledge transfer of education professionals. It brings teachers together for rigorous conversations that are conducive to knowledge sharing and enables teachers to make connections with

other teachers so as to create powerful learning experiences for them (Cheng, 2009). That is why knowledge transfer through social learning in communities of practices (CoPs) has increasingly grown in popularity among the teaching profession (Brouwer, Brekelmans, Nieuwenhuis, & Simons, 2012; Kimble, Hildreth, & Bourdon, 2008; Kirschner & Lai, 2007), including higher education institutes.

6.2.1 A CoP in Higher Education Institutes (HEIs)

A CoP could be applied in HEIs to overcome intellectual isolation, generation of tangible research outcomes, increased synergy and leverage, and creation of collaborative research (Ng & Pemberton, 2013). It brings a group of academics together who have a shared vision to overcome dynamics of fragmentation, isolation, and competition within universities (Pharo, Davison, McGregor, Warr, & Brown, 2014). The CoP could assist teacher educators to learn alongside more experienced colleagues and become fully fledged researching academics (Hill & Haigh, 2012). The knowledge management strategy of using CoP to enhance knowledge sharing could not only cultivate a culture that links teaching practice to scholarship within an organizational framework for group interactions (Gallagher, Griffin, Ciuffetelli Parker, Kitchen, & Figg, 2011), but also provoke a reflective culture through critical reflection and dialogue to justify individual teaching experiences (Herbers, Antelo, Ettlting, & Buck, 2011).

A CoP is a professional development framework for teacher educators in which collaborative learning can support growth and change (Hadar & Brody, 2010). It may be seen as a new peer mentoring model to cope with the increased focus on interdisciplinarity and collaboration in academia (Henrich & Attebury, 2010). Under an effective facilitation and cultivation, CoP can be effective and sustainable in enhancing learning, teaching, and professional development with far-reaching consequences. Institution-led teaching fellowships that focus on pedagogic research and operate within the context of collaboration and sharing of practice are thought to be an effective model for promoting real teaching excellence (Jones, 2010). It could have a positive impact on early-career academics' interest in the teaching process, their identity as a member of the university community, and their understanding of, and interest in, the scholarly work of teaching and learning (Cox, 2013). The development of CoP can be promoted by using knowledge sharing in the form of selected boundary objects, such as knowledge for writing research proposals (Benn, Edwards, & Angus-Leppan, 2013).

6.2.2 Cultivating CoPs

A CoP consists of dynamic social structures that require cultivation so that they can emerge and grow (Wenger et al., 2002). A CoP emerging from bottom-up initiatives

does not mean that organizations cannot do anything to influence their development. Most CoPs are increasingly initiated by a sponsor in the senior management level, instead of emerging spontaneously (Fontaine, 2001). Despite the fact that CoPs do not usually require heavy institutional infrastructures, the school could design a community environment, foster the formalization of the community, and plan activities to help grow and sustain a CoP. Although the concept of a CoP is different from a team or group (Wenger et al., 2002), the existence of a common goal as a driving force to bond the members together at the initial stage of the development would be very similar, and thus, strategies for building a team or group that focuses on developing a common goal may also be adopted to launch a CoP.

Facilitation can be defined as *“making things easier by using a range of skills and methods to bring the best out in people as they work to achieve results in interactive events”* (Townsend & Donovan, 1999, p. 2). The facilitator role entails a wide variety of behaviors, including leadership behaviors (Schuman, 2005). An effective facilitation strategy is critical to the development and sustainment of CoP. Facilitation strategies may focus on how to balance member participation and the reification of the knowledge deliverable. Participation is used to describe the activities of members in engaging with other community members and in the life of the community. It is not limited to simple collaborative behaviors. “It can involve all kinds of relations, conflictual as well as harmonious, intimate as well as political, competitive as well as cooperative” (Wenger, 1998, p. 56). Because of the participation, CoP members could develop their identities in the CoP. Because participation in a community contributes to their identity, they carry your participation with them wherever they go. Reification means “making things real.” A CoP creates artifacts such as documents and transcripts and records in the course of their activity. Reification points to the activity in a CoP of transforming knowledge into tangible and transferable capital. A CoP produces knowledge, but reification, the process of producing knowledge, does not merely support communications and interactions between participants; it eventually becomes a payoff to the KM activities. Between participation and reification, they form a mutually supportive ecology. They are in tension because if either dominates, then the other one suffers, and the community will collapse. If participation dominates at the expense of reification, then the value of participation to members suffers, and so participation declines. If reification dominates at the expense of participation, then the life and richness of the community disappears, and reification itself dries up (Wenger, 1998, pp. 65–71). While this duality may appear highly theoretical, it has some very practical implications for how communities are established, resourced, and managed. Figure 6.1 shows the relationship between participation and reification through a diagram of Tai-chi (Yin–yang).

Fig. 6.1 Participation and reification of CoP facilitation



6.3 A CoP in Field Experience Supervision

The research question of the chapter is: How can we balance the participation and reification of a CoP for leveraging knowledge? The CoP of this study brings together academic and teaching staff who have some responsibility for supervising student-teachers' field experience to share experience and seek solutions that will enhance field experiences for student-teachers. Through sharing meetings, seminars, and workshops, the CoP has enabled the members to retrieve, share, and use the knowledge on FE supervision and effectively supported the implementation of the new FE curriculum. Best practices of FE supervision have been codified into explicit knowledge as a guidebook by capturing tacit knowledge from the CoP members for knowledge transfer. Members know how to apply effective facilitation skills for provoking student's reflection during their FE supervision, in which they help their student-teachers to internalize pedagogical theories into their own knowledge and teaching skills. The CoP of FE supervision aims to facilitate the professional learning and sharing of knowledge about FE and capture good practice in supervision so as to improve it.

The researcher as the facilitator of the CoP has kept a reflective diary for self-evaluation. The evaluation mechanism involves setting evaluation criteria, collecting feedback and information after each activity, and interpreting the information for improvement. The criteria which were defined as relevant indicators for the CoP's success were strongly linked to the objectives defined in the proposal, which are related to learning, knowing, or process improvements. The frequency of meetings and the attendance rate of the communities of practice members were also collected. Data gathering thus aimed at uncertainty reduction for the core team in the sense that it allowed team members to assess their work against the formal project objectives. The research then decided whether the activities were a success or a failure and whether the criteria defined at the beginning had to be adapted or not.

Finally, the knowledge about what should and could be improved was held by the researcher.

6.3.1 How the CoP Was Nurtured?

At the preparation stage, we conducted our first CoP meeting to share our visions for the CoP and the development of field experience (FE) in our institute. We then consented to conduct a review of the existing knowledge resources from previous projects related to FE. We conducted our second meeting to present the FE resource list that is related to the FE projects conducted in the last time few years to build a repertoire to store the FE resources and as a platform for knowledge sharing on FE. At the development stage, we consented to organize a few seminars for knowledge sharing on FE so as to recruit new CoP members. We conducted workshops on lesson observation and analysis to improve the effectiveness of teaching supervision in the institute. The workshops were conducted in the form of a seminar and joint lesson observation, and analysis activity so that participants could share with others their experience of lesson observation and analysis during teaching supervision. In the workshops, these experiences were shared among colleagues to raise the quality of teaching supervision. We conducted a seminar to report on our CoP project on FE supervision to colleagues so as to recruit more members. The importance of FE supervision for student learning and the function of CoP for knowledge transfer were also disseminated.

To honor member participation, we introduced a recognized reward mechanism in our CoP. Members who participated in CoP meetings and shared their experience were appreciated by others. The CoP coordinators thanked them and invited them to facilitate the upcoming CoP meetings for building reputation. In fact, our CoP members are motivated by obligation and are willing to work out the joint enterprise of the CoP. We all knew that the social relationship for creating mutual engagement cannot be regulated by the reward mechanism imposed by an organization. Moreover, for scholars, the greatest reward is the new knowledge which they can exchange and the benefit it brings to research, teaching, and scholarships. Since the motivation for participation of our members is still high, the existing peer recognition practices and coordinators' positive feedback are deemed to be effective.

6.3.2 How the CoP Was Evolved?

At the knowledge-leveraging stage, we conducted storytelling workshops to identify the challenges of FE supervision and capture the tacit knowledge of the participants to draft the outline of the FE supervision booklet. We conducted a knowledge café to provide colleagues with a sharing platform that facilitates open

and creative communication. The participants shared their experience and exchanged views on how to provoke student–teachers’ reflection in the post-lesson conference or other specific topics under FE supervision. Useful facilitation techniques helping student–teacher reflection were captured, which took the form of a four-stage consecutive discussion which logically passes through: objective discussion, reflective discussion, interpretive discussion, and decisional discussion. Another example was to provide student–teachers with a safe communicative environment that is conducive to professional dialogue and reflection. These examples were captured and codified into guidelines as reification of the CoP.

In this stage, there were multiple levels of participation in our CoP during the operation stage. The core group members had passion and engagement to energize and nurture the CoP. We inquired about the needs of the members and invited knowledgeable members to share ideas so as to sustain the CoP. There were active members who were recognized as practitioners and who defined the domains of CoP when they had some specific points in FE supervision to contribute to the CoP. However, some members had a sustained connection to the CoP for knowledge retrieval with less engagement because they did not have as much personal experience in FE supervision and they played a role as CoP users. Other members participated only when the topic was of their special interest because they wanted to receive or provide a service or to gain access to guidelines produced by the CoP. It has to be acknowledged that time pressure was an issue and arises due to significant competing demands on staff time, leading to difficulties in convincing staff to engage in and prioritize the CoP activities. This can be evidenced in both reluctance to engage and also a practical approach to engagement which may compromise the ability to develop shared practice and a collective identity.

6.3.3 Rebalance Participation and Reification

It is a fact that expecting everyone to contribute to the CoP is a myth. When most of the members retrieved the knowledge they wanted, their participation became inactive. This inactive participation alerted us to reconsider the domain of our joint enterprise. The domains of lesson observation and facilitation skills in FE supervision had been discussed for over 2 years; it was therefore time to review and renew so as to develop the competencies in FE supervision of our existing members and potential members. The solution up to this stage was to change the domain so as to rebalance the participation and reification to sustain the function of the CoP. We had been inquiring about the needs of the members and colleagues in order to design the domain of knowledge sharing.

The domain of the CoP should be aligned with the needs of the members. A new domain was identified, which meant the CoP supported the implementation of the new FE curriculum framework of our institute. The new domain of the CoP was to seek a standardization and modulation of the FE assessment. The goal of the CoP was to fill the knowledge gap of the implementation plan for standardization and

modulation by using a video-based learning community (VBLC). VBLC is a Web platform which enables video-based FE assessment function. Members could compare their assessment records with the norm from all assessors regarding a lesson. CoP is commonly adopted as a “tool” to leverage knowledge to support the implementation of an organization development or implementation plan. We had found the point of balance between participation and reification to optimize knowledge sharing for producing best practice by shifting the CoP domain to form another joint enterprise.

New domains of the CoP which indicated the possible directions for sustaining the CoP were generated from professional dialogue during the meetings. The domain was also related to member professional practices: conducting FE assessment. There had been constructive values emerging from different stories of FE supervision and assessment which seemed to indicate that inconsistent practices were exercised, but they reflected different thinking that was driven by varying pedagogies. We also discovered that there were different approaches in facilitating student–teacher reflections. For example, regarding different expectations of a good lesson plan, some might focus on teaching strategies, and others might look for pedagogical content knowledge. There was a debate on whether we should make comments on the lesson plan in detail within a very short time. Some might worry about causing stress and affecting the deliberative teaching behavior of the student–teacher, but others argued that it is our obligation to do so. Identifying the conflicts or inconsistent practices among FE supervisors through lesson observation and assessment in the VBLC enables the coordinator to formulate critical issues for professional dialogues in the CoP meeting. Lesson planning, managing student diversities, assessment of learning, and assessing student–teachers’ reflective abilities are examples of the critical issues in FE supervision.

6.3.4 Evaluation of the CoP

The core team of the CoP has conducted periodic self-evaluation after conducting each activity. The mechanism involves setting evaluation criteria, collecting feedback and information after each activity, and interpreting the information for improvement. The criteria which were defined as relevant indicators for the CoP success were strongly linked to the objectives defined in the CoP proposal, which are related to learning, knowing, or process improvements. The frequency of meetings and the attendance rate of the community of practice members were also collected. Data gathering thus aimed at uncertainty reduction for the core team in the sense that it allowed team members to assess their work against the formal project objectives. The core team then decided whether the activities were a success or a failure and whether the criteria defined at the beginning had to be adapted or not.

The CoP members are mainly FE coordinators and supervisors from different departments of the institute. They want to learn how to do better in the course of

regular interactions. This reflects that they are highly motivated to participate knowledge-sharing events and this participation defines their membership. They have given very positive comments on the VBLC. They agree that the VBLC serves as a user-friendly online platform that contributes to the co-construction of knowledge in lesson analysis. The VBLC has generated descriptive statistics for users to compare their assessment results with the overall mean scores of each assessment item. The VBLC enables member reflections on their discrepancies with the norms and also provides the agenda for the face-to-face meeting. The statistical reports generated from the VBLC show that most of the standard deviations (SDs) of same items in the FE supervision form have been reduced from 0.8 to 0.6 on average. This reflects that the discrepancies on what were good teaching practices regarding our new FE curriculum among the members have been narrowed.

The CoP has cultivated a culture of trust among the members such that they feel free to share their tacit knowledge, ideas, and even the problems encountered during their FE supervision in a safe environment. The notion of “safety” and “trust” commonly appears in CoP literature. Safety and trust within a community of practice are important for developing a learning environment. A CoP is different from a project team. CoP members are accountable mutually, but project team members are accountable to their line managers. A CoP provides a safe communicative environment to facilitate organizational learning. Members do not mind exposing their ignorance to others in the CoP; they accept that making mistakes is a learning opportunity. Eventually, a booklet was produced to provide examples to illustrate the rubric of the new FE supervision form and effective facilitating skills in post-lesson discussion.

6.3.5 Learning from Cultivating the CoP

There are many learning points on cultivating the CoP in FE supervision. Firstly, we observed that the better the personal relationships among members, the more the tacit knowledge that was elicited. To cultivate a culture of trust is a critical success factor for running a CoP for knowledge sharing. Secondly, supporting professional practices of the members and the implementation of the institute policy should be considered as the key principle in designing the domain of the CoP. The members join the CoP in FE supervision because FE supervision is one of their major professional practices. They want to learn how to implement the new FE curriculum. Domains of CoP should be aligned with the major concern of the institute’s development plans so as to fill the potential knowledge gaps for implementing the development plans. Thirdly, the reification and participation should be balanced to sustain the development of the CoP. Participation is the direct interaction between CoP members. Reification is a way of making an abstract and concise representation of practice and is carried out through knowledge elicitation from member participation. Reification of knowledge and members’ participation support each

other until reaching a saturation point for generating best practice until members become reluctant to participate and share. Then, they become opposing factors.

6.3.6 *Self-sustaining Mechanism*

Following the rule of balancing participation and reification, a self-sustaining mechanism has been nurtured in the CoP in FE supervision. The mechanism attracts interest and active participation, effective promotion, provision of information resources, and rewards. Core CoP members will continue to identify the needs of the members related to their professional practices in FE supervision and then organize knowledge-sharing activities to address their needs. To create mutual engagement for sustaining the CoP, active CoP members will be invited to conduct seminars and workshops. A knowledge repertoire, a tangible booklet, and intangible collective intellectual resources among CoP members have been created. The CoP in FE supervision is an organic community that develops and grows as it disseminates its outputs to the institute. The CoP facilitators nurture the development and mutual recognition among individual members into a team or collective. This has led to more consistency for students and more cohesion of teaching and learning within programs. Additionally, as collective identities have formed, this has led to the development of a collective voice for members and involvement in policy discussions within the institute. We would argue that these outcomes suggest that our CoPs have generated benefits for the institute and for students, as well as for staff.

6.4 Conclusion

This paper aims at examining the theory for its potential contribution to the cultivation of a CoP, in an attempt to gain a balance between participation and reification. A communities of practice (CoP) is a group of people conducting a joint enterprise to improve their professional practice. The staff engage mutually in CoP activities and aim to create a sharing repository for sharing knowledge and supporting their learning. As an effective approach for enhancing staff professional competencies in lesson analysis and FE supervision, the ultimate goal of the CoP is for the improvement of student learning. The VBLC enables the staff to perform inquiry on their profession practices of lesson analysis and strengthen their FE supervision skills. The digital technology applied in the VBLC helps to broaden the conceptualization of organizational learning, and it supports SoLT activities and supports staff capacity building in changing teaching practice as well as performing inquiry on the change.

A CoP can be applied as a knowledge management tool for leverage knowledge to support organization development. It helps to connect the shared domain to the

institutions' strategic focus, to encourage the members to move forward with agenda, as well as to keep a focus on the shared domain. The alignments between the institutes' goals and CoP's goals need to be constantly verified. A CoP cannot be self-created, but requires cultivation and facilitation. For that reason, the institution plays an important role in engaging staff in the SoLT activities through the participation in CoP activities if leaders of institutions really want to develop the professional competencies of their staff. Institutions should cultivate a knowledge-sharing culture, support staff to have a professional identity as knowledge workers, and capitalize on existing knowledge recourse to address issues.

Being a disciple of CoP for professional growth, the author has shared the practices of CoP through many seminars in the institution and has disseminated the theory CoP through paper presentation in many international conferences and publications including a paper entitled *Developing Strategies for Communities of Practice* and a book entitled *Knowledge Management for School Education*. The author will continue to apply CoP to leverage knowledge not only for improving his professional practices but also for building research capacities.

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Chapter 7

RETRACTED CHAPTER: Affordances and Constraints of BYOD (Bring Your Own Device) for Learning in Higher Education: Teachers' Perspectives

Yanjie Song and Siu Cheung Kong

Abstract This paper reports on a study in the Scholarship of Learning and Teaching (SoLT) aiming at examining the affordances and constraints of BYOD (Bring Your Own Device) for varied pedagogical practices from teachers' perspectives in higher education to enhance students' learning. Seventeen teachers from eight departments and centers participated in the 1-year study. The affordances and constraints of BYOD were examined under the "framework of affordances and constraints in BYOD-supported learning environment." Data collection included class observations, class videos, field notes, resources on the BYOD Web site, and teaching plans. Content analysis was adopted for the data analysis. The research findings show that (1) seven types of BYOD conceptualized affordances were identified for varied pedagogical purposes; and (2) three types of technical, social, and personal constraints were singled out. The findings provide insights for teachers to make use of the affordances of BYOD for innovative practices.

Keywords Bring Your Own Device · BYOD · Affordance · Constraint
Higher education

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7.1 Introduction

Mobile devices have been embedded in higher education settings. In Hong Kong, in 2014, over 90% of youth (15–29-year-olds) owns a smartphone (<http://www.globe.hk/blog/smartphone-usage-hong-kong/>). More and more students use their devices for learning-related information access and communication purposes (Dennen & Hao, 2014). Parallel with it are the increasing trials of adopted BYOD (Bring Your Own Device) model in higher education (e.g., Dennen & Hao, 2014; Kobus, Rietveld, & Van Ommeren, 2013). BYOD refers to a technology model where students bring a personally owned device to support their studies (Alberta Education, 2012). Academics are exploring effective ways of integrating BYOD into student study lives both in and out of classes to bridge the gap between formal and informal learning. However, frequently reported from these studies are the ethical and security issues related to BYOD use in higher education (e.g., Kobus et al., 2013). Few studies have reported what BYOD can offer and what are the constraints of BYOD other than the reported issues from the perspective of practitioners in higher education. Thus, this study in the Scholarship of Learning and Teaching (SoLT) aims at exploring the affordances and constraints of BYOD for pedagogical practices from a group of teachers who are involved in the teacher professional development to enhance students' learning. It is expected that the findings will enhance teacher capacity in attempting to employ pedagogical innovations supported by BYOD and conduct SoLT work.

7.2 Related Literature

7.2.1 *BYOD in Higher Education*

Mobile technologies have been widely adopted in higher education. Many studies have investigated student perceptions on learning with mobile devices (e.g., Gikas & Grant, 2012; Sølvsberg & Grönlund, 2013). A few studies have examined the application of designed learning environment or tools on mobile devices borrowed from universities to teaching and learning (e.g., Kobus et al., 2013; Sølvsberg & Rasmussen, 2012). However, it is reported that teacher-led adoption of BYOD in higher education remains scant (Dennen & Hao, 2014). Moreover, a recent study reported that students' high mobile device ownership rates by no means imply their preference or support for university BYOD strategies (Kobus et al., 2013). To benefit student learning with mobile devices, teachers play key roles. Nevertheless, many teachers are reportedly reluctant to use new technologies in their teaching due to various issues such as lack of competency in terms of technology use and pedagogical design, resistance in technology use, and lack of technical support (Dennen & Hao, 2014; Song & Looi, 2012). Thus, it is important to develop a teacher community to explore the affordances of BYOD for teaching and learning.

7.2.2 *Affordances*

Ecological approach takes the interaction of agent with environment as fundamental. Gibson (1979), from an ecological perspective posits, “Affordances exist only within the context of an animal—environment system” (p. 2). They are relational properties between the agent and the environment. Kaptelinin and Nardi (2012) maintain that Gibson’s theory of affordances is constrained in animal and natural environment relationships that cannot go beyond its scope to address the technology affordances in human–computer interactions. Thus, Kaptelinin and Nardi (2012) propose understanding technology affordances from a social-cultural perspective as “possibilities for mediated human action (p. 975)” because according to Wertsch (1998), human actions and mind are mediated by tools including technology tools people use. Based on the definition of technology affordances, in this paper, the authors define affordances of BYOD as “possibilities of adopting BYOD for mediated pedagogical practices” where pedagogical practices refer to teaching and learning activities.

7.2.3 *Affordances of Mobile Technologies in Education*

The concept of technology affordances has also been used in the area of information and communications technology (ICT) including mobile technology applications in education to explore the possibilities that the educational technologies provide for students in ICT-rich learning environments (e.g., Churchill, Lu, & Chiu, 2014; Klopfer & Squire, 2008; Song, 2011). Affordances of mobile technologies have been used in varied learning activities, including but not limited to a multimedia access tool for learning by exploring and reflecting; a multimedia collection tool for learning by visualizing and reflecting; communication tool for learning by conversing; connectivity tool for learning by sharing; representation tool for learning by visualizing; and knowledge construction tool for learning by constructing (Churchill & Churchill, 2008; Jonassen, Hernandez-Serrano, & Choi, 2000; Song, 2011). However, the majority of the studies have either explored the affordances of designed tools on mobile devices for learning (e.g., Dennen & Hao, 2014) or affordances of mobile devices from student perspectives (e.g., Song, 2011). Few studies have examined the affordances of BYOD from the perspective of teachers. Understanding the affordances of ICT and its evolution in pedagogic practices helps support learners as they learn, and teachers as they make decisions on the adoption of new technologies (Conole & Dyke, 2004).

7.2.4 Constraints

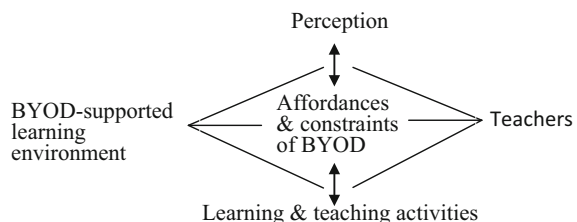
Gibson (1979) maintains that some affordances of the environment are beneficial and some are harmful. “Any one [technology] affordance can be considered to have both positive and negative connotations” (Conole & Dyke, 2004, p. 113). For instance, SMS can be used to send a message, and it can also limit the sending process if the message is a long text. Thus, Conole and Dyke (2004) argue that an affordance of the technology does not simply contribute to the intended use but also result in the unintended consequences. The affordances of ICT may not be explored effectively without coping with these barriers. Norman (1998), from the perspective of a designer, points out three categories of action constraints of technology. They are as follows: (1) physical constraints (the features of the technology), (2) logical constraints (the operation of technology system), and (3) cultural constraints (the way the technologies are used by conventions that are shared by a cultural group). Physical and logical constraints are all concerned with the device itself and thus can be considered technical constraints. In addition, cultural constraints should be addressed in a wider scope to include broader social factors such as institutional and community factors (Jonassen et al., 2008; Song, 2010). Finally, the user’s personal factors may also be a type of constraints in perceiving and acting on the affordances. Thus, the three categories of technical, social, and competence constraints are examined in this study when we investigate teachers’ perceptions of and actions on BYOD affordances.

7.2.5 Framework of Affordances and Constraints of BYOD in Higher Education

Affordances of BYOD cannot be perceived and used in isolation from what happens in the learning environment as a whole. Adapted from van Lier (2004)’s affordances in context framework (p. 96), we developed the framework of affordances and constraints in BYOD-supported learning environment (see Fig. 7.1).

Figure 7.1 shows that teachers, the BYOD-supported learning environment, perception, learning and teaching activities, and affordances and constraints of BYOD are all relational. In addition, perception of the teachers in the

Fig. 7.1 Framework of affordances and constraints in BYOD-supported learning environment



BYOD-supported learning environment for specific learning and teaching activities influences the adoption of affordances of BYOD to mediate pedagogical practices and the encounters with constraints; on the other hand, specific learning and teaching activities in the BYOD-supported learning environment may also influence the teachers' perception of the adoption of affordances of BYOD and consideration of constraints. In this study, affordances of BYOD to mediate teaching and learning and constraints of BYOD are examined from teachers' perspectives under this framework. The research questions to be addressed are as follows:

1. What are the affordances of BYOD for learning and teaching in higher education from teachers' perspectives?
2. What are the constraints of BYOD encountered in learning and teaching in higher education from teachers' perspectives?

7.3 Research Methods

This study situates in a 2-year research project “BYOD (Bring Your Own Device) for reflective engagement of learners in digital classrooms.” This paper reports on the research results obtained from the first year study.

7.3.1 Participants

Participants were recruited through the institute-wide e-mail invitation for voluntary participation in the project. In the first semester, 13 teachers joined the project, and in the second semester, another 4 teachers joined the project. Thus, there were 17 teachers in total as BYOD project members involved in the first-year project. The teachers numbered from 1 to 17 were from different departments or centers at a higher education institute (see Table 7.1). Four teachers had 1–3 years' experience in teaching with mobile technologies. The rest had no prior experiences. They took 22 courses in total involving 520 students. A few teachers took more than one course in the project. A BYOD Web site was designed for community building and BYOD implementation support, where an introduction to the project, featured activities, and BYOD resources (sample teaching schemes, BYOD class video clips, and various apps for BYOD) was provided.

Table 7.1 Profile of the 17 teachers numbered from 1 to 17

Teacher	Department/Center	Teaching experience in mobile technology use
1	Mathematics and Information Technology	Mobile-supported pedagogy for 3 years
2	Mathematics and Information Technology	Mobile and seamless pedagogy for 2 years
3	Curriculum and Instruction	New trial use
4	Mathematics and Information Technology	New trial use
5	Mathematics and Information Technology	New trial use
6	Health and Physical Education	New trial use
7	Health and Physical Education	New trial use
8	Mathematics and Information Technology	New trial use
9	Linguistics and Modern Language Studies	Mobile-supported pedagogy for 2 years
10	Mathematics and Information Technology	New trial use
11	Literature and Cultural Studies	New trial use
12	Chinese Language Studies	New trial use
13	Science and Environmental Studies	New trial use
14	Language in Education	Mobile-supported pedagogy for 1 year
15	Language in Education	New trial use
16	Mathematics and Information Technology	New trial use
17	Mathematics and Information Technology	New trial use

7.3.2 *BYOD-Supported Learning Environments of the 17 Teachers*

Learning environment, in a broad sense, relates to almost everything in the pedagogical practices. In this paper, regarding the BYOD-supported learning environments, we focus on the physical facilities (e.g., WiFi), the courses taken by the teacher, and the BYOD apps or learning platform that the teacher adopted for different purposes. The BYOD-supported learning environments of the 17 teachers are shown in Table 7.2. Among the 17 teachers, except Teacher 14 and Teacher 15, all the other teachers took different courses, but some of them adopted the same apps. For example, 8 teachers chose Moodle and 6 teachers chose Edmodo as the learning management platform and social learning platform respectively. In addition, Google Drive and QR code apps were also adopted by a few teachers.

Table 7.2 The BYOD-supported learning environments of the 17 teachers

Teacher	Course	Apps/platforms and their uses for different purposes in WiFi covered environments
1	E-learning in primary schools	Edmodo for online discussion, ideas sharing, and reflection
	E-learning in a Green and Cloud Computing Environment	
2	Mobile Technology and Society	Moodle, Google Drive, and QR code for Mobile learning and seamless learning using project-based approach
	The Phenomena of Internet and Digital Cultures	
3	General Education Foundation Course—Making Sense of Facebook; Smartphones, Tablets, WhatsApp and iEverything	Edmodo for polling
4	Honors Project	Edmodo, MindMeister, iPad Camera for polling, mind map, and presentation
	Web Database Design and Implementation	
5	Information Technology in Education	Edmodo, TotalRecall and Mindjet Maps for mobile learning and collaborative learning
6	Integrative Nutrition	Moodle for lunch recipe critique
7	Health Behaviors—Theory and Program Planning	Google Drive for student presentation and peer evaluation and reflection
8	Web Services Fundamentals	Moodle and Google Drive for Project outline construction/peer review
9	Introduction to Linguistics	Moodle, WiKiBook, Google Translate, Natural Reader, Dvolver, and Moviemaker for mobile language learning
10	Understanding Numbers	Edmodo for polling and in-class exercise submission
	E-Learning in a Green and Cloud Computing Environment (2014/02)	Lino for field trip planning
11	Creative Writing	Moodle for Collaborative poem construction exercise
12	Cantonese and Local Culture	Chinese Text Project (http://ctext.org/zh) for Cantonese phrase exercise
13	General Education Foundation Course Tutorial	Facebook, Google Drive and QR code for online discussion, ideas sharing and ICT tools exploration
14	English for General Academic Purposes	Moodle, Socrative and Google Drive for reading and writing exercises
	Subject Specific English Enhancement	
15	Subject Specific English Enhancement	Google Drive for reading exercises
16	Web Intelligence	Schoology for student presentation and peer assessment
17	Managing and Teaching in an IT-rich Environment	Moodle, Google Map and QR code for mobile learning

7.3.3 Data Collection

Data collection includes class videos, teacher interviews, field notes, teaching plans, and resources on the BYOD Web site. The BYOD project members were suggested providing at least one teaching plan for a lesson for class observation and video-taping in the first year, where field notes were taken. Some teachers were observed and video taped more than one lesson. There were totally 22 class videos and field notes collected. In addition, 17 individual teacher interviews were conducted to understand teachers' perceptions of BYOD for teaching and learning. The teacher interview included questions in the three categories: BYOD advantages for learning and teaching, BYOD constraints, and teacher attitudes toward using BYOD for learning and teaching. Teaching plans were collected from teachers prior to their enactment of the BYOD lesson. The BYOD Web site includes data such as sample teaching schemes and BYOD class video clips.

7.3.4 Data Analysis

All the teachers' class videos were reviewed, focusing on examining the affordances of BYOD and constraints in pedagogical practices. Drawing on pattern clarification strategies for identifying themes and patterns (Huberman & Miles, 1994), categories of affordances and constraints were coded. All the teacher interviews were transcribed to understand the teachers' perceptions of the affordances and constraints of BYOD for learning and teaching. The affordances and constraints of BYOD were triangulated by teaching plans, teacher interviews, field notes, and resources on the BYOD Web site. Table 7.3 shows the data collection and analysis for addressing the research questions.

Table 7.3 Data collection and analysis

Data	No.	Q1. affordances	Q2. constraints
Class videos	22	x	x
Teaching plans	22	x	x
Field notes	22	x	x
Resources on BYOD Web site	^a	x	x
Teacher interviews	17	x	x

^aResources on BYOD Web site cannot simply be counted as they have different categories

7.4 Results

Both the affordances and constraints of BYOD were examined under the “framework of affordances and constraints in BYOD-supported learning environment” as shown in Fig. 7.1. The results are reported in this section.

7.4.1 Affordances of BYOD for Learning and Teaching

Seven types of affordances of BYOD were conceptualized for varied learning activities. They are as follows: resource access tool, communication tool, resource collection tool, resource submission tool, knowledge construction tool, resource sharing tool, and representation tool. The description of the tools and learning activities are shown in Table 7.4.

Table 7.5 shows that resource access is the mostly reported uses of BYOD affordances for varied learning and teaching activities (9 reported cases); and representation is the least reported use (3 reported cases).

We also summarized the 17 teachers’ perceptions of the affordances of BYOD in 13 categories, namely BYOD can be used for (a) communication within and beyond the classroom; (b) project-based learning within and beyond the classroom; (c) engaging students in a large-size lecture; (d) bridging the gap between lectures and tutorials; (e) tracking students’ learning process within and beyond the classroom; (f) motivating students to learn; (g) designing collaborative activities; (h) planning authentic learning activities beyond the classroom; (i) planning authentic learning activities within and beyond the classroom; (j) student access of learning resources and information within and beyond the classroom; (k) student sharing of their work within and beyond the classroom; (l) student review and comment on others’ work within and beyond the classroom; and (m) student continuity of their work after class.

By comparing the perceptions of the teachers with the affordances of BYOD they used in the BYOD-supported learning environment, it is noted that the teachers’ perceptions are consistent with the affordances of BYOD adopted in their pedagogical practices. It is noted that Teachers 1, 2, 9, and 14 perceived very positively about how to adopt the affordances of BYOD to mediate their pedagogical practices not just in one lesson but in the entire course they taught. Teacher 1 reported that with BYOD, he was able to be connected with the students on Weibo social network platform, and engage them in learning activities anytime, anywhere throughout the course; in addition, the online learning activities mediated by BYOD left “footprints” that helped students with their reflective learning and helped teachers with the refinement of pedagogical designs. Teacher 2 reported that with BYOD, she could enact mobile and seamless learning using project-based learning approach more effectively in the whole course on the learning management platform—Moodle and using different apps such as Google Drive and QR code as tools for varied teaching and learning purposes. Teacher 9 reported that he had been

Table 7.4 Seven conceptualized BYOD affordances for varied learning and teaching activities

Affordance	Learning activities	Description
Resource access	Instructional	Accessing online/downloaded resources in order to improve various skills such as English/Chinese listening, reading, speaking, and writing skills
	Referential	Accessing online/downloaded resources as a reference to complete various learning tasks
	Reflective	Assessing course materials on learning platforms for course review and reflection such as accessing online/downloaded recorded lectures, lecture handouts, and other course-related materials to improve one's understanding of the course concepts
	Explorative	Accessing the Internet to explore useful online resources to formulate research questions or identify research problems
	Collaborative	Accessing information shown on the mobile device together with peers for collaborative learning
	Interactive	Decoding QR code to interact with the content presented in text, images, or a Web link which leads to the learning resources
Communication	Socializing	Communicating for socializing purposes on social network platforms
	Collaborative	Communicating for the purposes of discussing and sharing certain things and working together on learning management platforms or social network platforms
	Informative	Communicating for informing others' information about study or current events
Resource collection	Reflective	Capturing notes and images for later review and reflection; collecting survey data for reflective learning and teaching
Resource submission	Submitting	Uploading learning-related resources such as assignments and useful information
Knowledge construction	Constructive	Creating, editing, or drafting documents, such as assignments and reports using Word Mobile, Google Drive, or other downloaded software
Resource sharing	Collaborative	Facilitating collaborative work by sharing files via varied apps such as NFC, Google Drive, and QR code.
	Reflective	Sharing work and providing reflective comments for peers on varied learning platforms
Representation	Visualizing	Creating visualization and representations that demonstrate thinking and knowledge such as representing images or video clips on the mobile device to improve one's understanding of the concept or idea

using the affordances of mobile devices in his pedagogical practices for over 2 years, including the sample lesson provided for us. In his course, he always encouraged students to use BYOD to access the learning platform—Moodle and apps such as Moodle, Wiki Book, Google Translate, and Moviemaker to access,

Table 7.5 Affordance of BYOD and their uses by the 17 teachers

Teacher	Affordance	Resource access	Communication	Resource collection	Resource submission	Knowledge construction	Resource sharing	Representation
1		Reflective referential	Collaborative referential		Submitting		Reflective	
2		Explorative interactive		Reflective	Submitting	Constructive	Collaborative	Visualizing
3			Collaborative	Reflective				
4				Reflective	Submitting			Visualizing
5							Collaborative	Visualizing
6		Referential				Constructive		
7							Collaborative reflective	
8		Referential					Collaborative reflective	
9		Explorative			Submitting	Constructive	Collaborative	
10			Collaborative			Constructive	Collaborative	
11								
12		Referential						
13			Socializing collaborative					
14		Instructional referential collaborative		Reflective	Submitting	Constructive		
15		Collaborative				Constructive		
16							Reflective	
17		Referential collaborative						

construct, create, and share their artifacts. Teacher 14 had been keen on mobile technology use to engage students in their language learning for over 1 year. In the sample lesson, she utilized the affordances of Moodle, Google Drive, and Socrative to mediate various pedagogical practices. This indicates that Teachers 1, 2, 3, and 4 perceived the pedagogical value of BYOD and had the motivation and capabilities to use a range of affordances in their practices in the BYOD-supported learning environment.

While, the other 13 teachers, also perceived and acted on affordances BYOD for learning and teaching, but centered on using an app or a platform for task-based activities as a trial teaching practice without continued intention, perception and action on the BYOD affordances to mediate learning and teaching activities.

7.4.2 Constraints of BYOD Encountered in Learning and Teaching

Teacher perceived constraints of BYOD in pedagogical practices are identified in three areas: technical, social, and personal constraints with descriptions (see Table 7.6).

Table 7.6 Perceived constraints of BYOD in learning and teaching

Perceived constraints		Description
Technical	App functionality	<ul style="list-style-type: none"> • Some versions of mobile applications are not functioning well and students encounter problems when using the apps to complete tasks • The design of the learning management system is not very mobile-friendly and students have to log in a few times when completing a learning task • The Web browser mobile apps cannot properly display some of the uncommon Chinese characters
	Screen size limits	<ul style="list-style-type: none"> • The screen size of some devices is very limited, and it is difficult for students to use smartphones to complete tasks that involve a large amount of typing actions, e.g., to construct an e-questionnaire, to read and draw
	WiFi infrastructure	<ul style="list-style-type: none"> • WiFi network on campus is not stable, which makes the adoption of BYOD challenging for both teachers and students. The teacher has to come up with a backup plan, and students have to spend much time waiting for loading contents
	Lack of recharge facility	<ul style="list-style-type: none"> • There were inadequate power outlets for students to recharge their devices, and it was problematic when their devices run out of battery
	Computing power: desktop versus BYOD	<ul style="list-style-type: none"> • In some IT courses, students may rely on desktops in computer laboratories since those computers are more powerful and the keyboard is more comfortable to work with compared to mobile devices

(continued)

Table 7.6 (continued)

Perceived constraints		Description
Social	Equity	<ul style="list-style-type: none"> When students bring different mobile devices into the classroom, how to leverage the differences between powerful and less powerful devices so as to ensure learning equity becomes a concern
	Teaching support	<ul style="list-style-type: none"> When adopting BYOD, more support needs to be provided in class both for teachers and students
	Less face-to-face communication	<ul style="list-style-type: none"> The use of mobile devices may reduce face-to-face interaction between students and teachers
Personal	Technical competence of teaching staff	<ul style="list-style-type: none"> It may be hard for teachers who do not have an IT background to teach with mobile technology
	Technical competence of students	<ul style="list-style-type: none"> Students need time to get used to utilizing mobile devices for learning in class (e.g., typing out an equation in mathematics learning)
	Unwillingness to use BYOD	<ul style="list-style-type: none"> There are still teachers who are not interested in or uncomfortable with using mobile devices to teach, so it would be hard to make BYOD sustainable in the school when only some teachers are willing to adopt them
	Time consuming	<ul style="list-style-type: none"> To carry out learning activities with the use of mobile devices may be time-consuming
	App choices for BYOD	<ul style="list-style-type: none"> Students bring different types of devices running various operating systems, so the teacher has to leverage these differences when choosing which apps to use
	Pedagogy	<ul style="list-style-type: none"> BYOD does not fit in every course or every topic. Teachers have to evaluate whether it is appropriate to integrate BYOD into learning and teaching activities because sometimes it would make teaching less effective

In order to better understand the constraints, we present the identified constraints reported by the 17 teachers in Table 7.7.

Table 7.7 shows that technical constraints were mostly reported by the teachers, which account for 58% (21) of the total reported constraints (36), followed by personal factors and social factors. Among the technical constraints, WiFi infrastructure problems were the mostly identified constraints for teaching and learning practices. In this study, all the teachers reported that they encountered various difficulties in terms of technical, personal, and social constraints while adopting the affordances of BYOD. The most reported constraints were technical constraints of unstable WiFi infrastructure followed by the constraints of app functionality across different operating systems and screen size limits. The social constraints identified by Teachers 1, 9, and 14 were concerned mainly with equity issues that the quality of BYOD brought by the students might be different. The personal constraints reported by Teachers 11, 15, and 17 were about the pedagogy concerns. To them, in many cases, conventional teaching such as lecturing was more effective than

Table 7.7 Constraints encountered by teachers of the study

Perceived constraints of BYOD in trial teaching		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Technical (21)	App functionality	✓	✓									✓	✓					
	Screen size limits		✓							✓								
	WiFi infrastructure		✓	✓	✓	✓					✓			✓	✓	✓	✓	✓
	Lack of recharge facility						✓											
	Limited computational power							✓										
Social (5)	Equity	✓								✓				✓				
	Teaching support										✓							
	Less face-to-face communication														✓			
Personal (10)	Technical competence of teaching staff	✓						✓										
	Technical competence of students										✓			✓				
	Unwillingness to use BYOD			✓														
	Time consuming						✓											
	App choices for BYOD								✓									
Pedagogy constraint															✓		✓	

innovative practices due to technical constraints of technologies. Many teachers reflected that due to the unstable Internet connection and the slow data transmitting speed, they felt disappointed, even annoyed when using BYOD in their pedagogical practices. This slowed down the lesson progress and discouraged them to use BYOD in class. However, some teachers also came across technical difficulties and they were able to cope with the constraints and explore new possibilities.

7.5 Discussions

The results of this study show that the 17 teachers from different departments designed different learning activities in BYOD-supported learning environments using different apps, they had different perceptions of the adoption of BYOD in teaching and learning, and the affordances of BYOD employed by the teachers are diverse. It is noted that some teachers adopted a range of affordances of BYOD in learning and teaching; while others only adopted one or two affordances. Some teachers experienced only technical constraints; while others also experienced personal and social constraints. The rest of this section will discuss the interplay between teacher perceptions, BYOD affordances and constraints, and mediated teaching and learning activities in BYOD-supported learning environments.

Firstly, BYOD affordances can be perceived and used on conditions of the learning environments supports the BYOD use; and the teacher has the intention and capability of taking pedagogical actions. This study shows that to perceive and actualize the BYOD affordances to mediate learning and teaching activities, on the one hand, the environment needs to enable the BYOD to be employed in the environment; on the other hand, the intention and capabilities of the teacher in taking the pedagogical actions are also critical (Jonassen et al., 2000; Song, 2011). According to the statistics of smartphone usage in Hong Kong in 2014, over 90% of youth (15–29) have the ownership of it and 96% of smartphone users use their phone to go online (<http://www.go-globe.hk/blog/smartphone-usage-hong-kong/>). This indicates that nowadays the learning environments are most likely supportive for BYOD use with Internet connections despite of the unstable WiFi connection problems, the big challenge is how teachers can be motivated to explore more possibilities of making use of BYOD for innovative pedagogical design. Nevertheless, Dennen and Hao (2014) report that teachers are reluctant to accept mobile technology-supported innovative approaches because these are deemed complex and contradictory to their routine pedagogical designs. Thus, teacher professional development is needed in this regard to empower teachers in innovative practices with new technologies.

Secondly, the capabilities for perceiving and acting on BYOD affordances can be increased in the pedagogical practices. This study shows that the teacher's capabilities of perceiving and acting on the BYOD affordances can be increased when she/he is increasingly involved in the innovative pedagogical practices because the affordances adopted in the earlier events can be employed to transform

the nature of later events (Song, 2013). It is noted in this study that resource access tool was used more frequently than any other tools. However, some teachers such as Teachers 1, 2, 9, and 14 adopted more types of affordances for a range of learning and teaching activities. The four teachers had 1–3 years' teaching experiences in using mobile technologies in their pedagogical practices. Their intention of adopting BYOD affordances in this study did not end with one lesson, but spanned over the whole course; while the other 13 teachers could not sustain the use of the affordances of BYOD in other lessons due to their unwillingness or lack of technological and pedagogical competence in sustained practices. This indicates that teachers need to be exposed to more BYOD-mediated pedagogical practices to enable them to perceive and employ the more affordances.

Thirdly, affordances and constraints of BYOD coexist in the learning and teaching activities. Affordances and constraints are coupled (Conor & Dyke, 2004). A number of constraints have been identified in this study, especially in terms of WiFi infrastructure and app functionality across different platforms. These constraints suggest that before making large-scale applications of BYOD in higher education, WiFi infrastructure needs to be improved to make Internet connection stable and fast, which is crucial for successful BYOD applications; and more and more apps across different operating systems should also be developed. In addition, some teachers pointed out the pedagogical constraints in using BYOD. A recent study reported that students' enthusiasm for using BYOD for learning anytime, anywhere might be reduced as time goes on (Rinehart, 2012). Thus, the use of the technology alone would be insufficient to foster learning and teaching without the adoption of appropriate pedagogies (Ertmer & Ottenbreit-Leftwich, 2013). For example, Teacher 9 reported, "BYOD does not fit in every course or every topic. Teachers have to evaluate whether it is appropriate to integrate BYOD based on the course content." This indicates that teachers need to improve their pedagogical approaches and intentionally adopt innovative pedagogy with technology through professional development. As for some teachers' concerns that BYOD strategies may affect the students in lower economic status which has also been expressed in the existing literature (e.g., Margaryan, Littlejohn, & Vojt, 2011), Kobus et al. (2013) argue that all students nowadays have a high probability of owning a mobile device powerful enough to support their studies. Thus, the constraints will become less and less evident with time goes on.

Conclusion and Implications

This study reported a study involving 17 teachers' perceiving and acting on affordances of BYOD for pedagogical practices, and conceptualized 7 affordances of BYOD for varied learning purposes. Three types of constraints were identified in the teachers' pedagogical practices. This research study is exploratory in nature and is by no means meant for generalization. Nevertheless, the research findings render

theoretical and practical implications for BYOD-mediated pedagogical practices in higher education.

Theoretically, this study developed the framework of affordances and constraints in BYOD-supported learning environment, which is useful for understanding the factors that influence teachers' perception and action on the affordances of BYOD for pedagogical practices. In addition, the conceptualized affordances and constraints of BYOD expand the dimensions in studying the advantages and limitations of the adoption of BYOD in higher education, which help extend learning outside the classroom and remove the dichotomy between formal and informal learning.

Practically, the affordances of BYOD can be further developed through a large-scale study in more fine-grained details in an attempt to set up an "affordance bank" with "best practice scenarios" to support SoLT work and staff capacity building for innovative practices. It can benefit more teachers to make flexible use of the affordances to design learning activities to achieve intended learning outcomes across different settings; it can also empower teachers to make use of the online learning trails on BYOD to assess students learning process, and identify their learning problems to make pedagogical refinement, where it is necessary to realize a paradigm shift from teacher-centered instruction to student-directed learning.

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Part II
Enhancement of Student
Learning Experience

Chapter 8

Plastic Waste Problem and Education for Plastic Waste Management

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Abstract Economic development and people's changing patterns of consumption and production have led to a drastic increase in plastic wastes all over the world. Plastic waste disposal harms the environment and poses threat to human health. Hence, there is great desire to reduce the plastic wastes. To reduce plastic wastes, education is of utmost importance as education can change people's knowledge, attitude, and behaviors toward plastic waste management. This study examines the effectiveness of three teaching strategies (direct teaching, hands-on teaching, and simulation game-based teaching) on change in knowledge, attitude, and behavior in students toward plastic waste management. The results are discussed in depth in this chapter.

Keywords Plastic waste education · Plastic waste management · Direct teaching · Hands-on teaching · Simulation game-based teaching

8.1 Plastic Waste Problem

The rapid urbanization and economic growth in different countries have led to a drastic increase in plastic production and consumption around the globe. Owing to the low recycling value of plastic and the lack of technological support, the recovery rate of plastic waste remains very low. Most of it is washed into the ocean,

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disposed of in landfills, or burned in incinerators. These enormous amounts of plastic waste bring disastrous consequences, such as pollution, food chain contamination, biodiversity breakdowns, energy waste, and economic loss. These plastic waste problems and adverse effects are especially serious and omnipresent in renowned countries/megacities such as Japan (PWMI, 2014), Taiwan (Walther, 2015), the UK (GHK, 2006; Howarth, 2013), and Hong Kong (Environmental Protection Department, 2013), where economic activities are flourishing and the plastic consumption level is high. Plastic waste not only causes air pollution (Li, Lee, Mi, & Su, 1995), land pollution (Barnes, Galgani, Thompson, & Barlaz, 2009; Steelys Drinkware, 2013), and harms human health (Crinnion, 2010; Elliott et al., 1996; Maffini, Rubin, Sonnenschein, & Soto, 2006; Yamamoto & Yasuhara, 1999), but it also causes water pollution (Howarth, 2013; Laist, 1987; Perkins, 2014; Schwartz, 2014; Zielinski, 2014) and contaminates the food chain (Rochman et al., 2014; Swan, 2008; Thompson, Moore, Saal, & Swan, 2009), endangers biodiversity (Derraik, 2002; Grant & Ryder, 2009; Gregory, 2009; McNamee, 2008), and causes enormous energy waste (Cho, 2012; European Commission, 2013; Hong Kong Cleanup, 2012; StudyMode, 2015; Themelis & Mussche, 2014), as summarized in Table 8.1.

Table 8.1 Current plastic waste problem in mega-cities

	Japan	Taiwan/Taipei	UK	Hong Kong
Status quo of plastic wastes	Around 9.3 million tons discharged per year	Near 7200 kg plastic waste collected on 18 beaches	5 million tons of plastic consumed per year	Around 730,000 tons of plastic waste discharged per year
Major source of plastic wastes	Domestic/packaging	Domestic/restaurants	Packaging	Municipal/shopping bags
Plastic waste management strategies	Incineration	/	/	Landfilling
<i>Crisis of plastic wastes</i>				
(a) Health	Respiratory infection	Food chain contamination	/	/
(b) Environment	Air pollution	Water pollution	/	Land pollution
(c) Biodiversity	/	/	Endanger biodiversity	/
(d) Energy	/	/	/	Energy waste and economic loss

8.2 Education for Plastic Waste Management

In order to reduce plastic waste, the popularity of plastic waste management among the public has to be enhanced by changing people's knowledge, attitudes, and behaviors toward plastic waste management. There are four areas of plastic waste management, which are (a) the 4Rs—reduce, reuse, recycle, and regeneration, (b) the two strategies—landfilling and incineration, (c) the four steps of recycling procedures—cleaning, separation, sorting, and compression, and (d) the knowledge of the life cycle of plastics.

8.2.1 *Education for Plastic Waste Management in Japan, Taiwan, The UK, and Hong Kong*

To cope with the serious plastic waste problem, education in plastic waste management is becoming increasingly prevalent all around the world, and in general there are four main different educational approaches, namely community-based education, government-based education, business-based education, and school-based education. Japan, Taiwan, the UK, and Hong Kong are, respectively, the representatives of these four approaches.

8.2.1.1 Japan

Characteristics

- Specific containers

The Japanese community is highly engaged in recycling and highly encourages Japanese citizens to do sorting at source before recycling by providing specific containers for PET bottles, PS foam containers, or PP bottle caps separately instead of mixing them with other plastics (Yoda, 1999).

- Publication and Broadcasting

The community promotes and provides guidance for recycling by the regular publication of various guidebooks and magazines, such as the door-to-door distributed Guidebook for Sorting Recyclables and Waste, regular articles relating to resource recycling posted in the newsletter, and “Minacle” 3R Information Magazine distributed in newspapers. In addition to publication, the Japanese community also broadcasts a special CATV program called “3R Forum” twice a year, which is sponsored by the 3R Promotion Committee (Hasegawa, 2014).

- Activities

The community and condominium residents together have formed some organizations, which voluntarily and periodically collect and gather resources mainly from household sources and then sell them to recyclers. In addition, the community also periodically launches some facility tours to incineration plants, recycling facilities, and other facilities (Hasegawa, 2014). Also, in the past 20 years, the Japan Environmental Action Network (JEAN) has been organizing beach cleanups and surveys every year (Lytle, 2015).

- Family education

In Japan, recycling also goes from the community into family. The municipal governments will set up rules and time schedules for the collection of recyclables, and most Japanese families follow those rules and schedules strictly by keeping the color-coded calendars with the rules and schedule on it in their kitchens to remind themselves (Hays, 2012). Those sorting rules include requiring households to separate plastic waste from other kitchen waste and to separate plastic wrappers, labels, and packages from polyethylene terephthalate (PET) bottles (McCurry, 2011).

Pros

The publication and the facility tours may enhance Japanese citizens' knowledge of recycling and plastic waste management. The specific containers, the voluntary activities, and the family education are likely to enhance Japanese citizens' behavior regarding plastic recycling.

8.2.1.2 Taiwan

Characteristics

- “Four-in-One” program

In 1997, the Taiwanese government established the “4-in-1 Recycling Program” in the hopes of stimulating the citizens to engage more in recycling. The program connected the collaboration of four different stakeholders, including community residents, recyclers and collectors, local governments, and the local recycling fund, to collect regulated recyclable waste, which includes 13 categories and 33 items, such as metal containers, glass containers, plastic containers, and waste electrical appliances. The waste plastic containers are further divided into 8 categories, which encourages sorting before recycling.

- Legislation

The Taiwanese government has enacted the Waste Disposal Act, which restricts the use and offering of plastic shopping bags and disposable plastic (including styrofoam) tableware to customers for free (Legislative Council Secretariat, 2005).

Pros

It is reported that the “Four-in-One” program enhanced Taiwanese residents’ behavior regarding plastic recycling and plastic waste reduction (Huang, 2013). The Environmental Protection Agency Taiwan pointed out that the introduction of restrictive legislation has successfully enhanced Taipei residents’ environmental protection awareness and changed their behaviors by using fewer plastic shopping bags and less disposable plastic tableware (Legislative Council Secretariat, 2005).

8.2.1.3 The UK*Characteristics*

- WasteCare

WasteCare is a leading plastic waste management and recycling company that has provided plastic waste collection, recycling, and recovery solutions for over 20,000 organizations throughout the UK for over 30 years (WasteCare, 2015).

- LUXUS

Luxus is another plastic management and recycling company, which collects plastic waste from businesses in the UK and then recycles it or returns it to the moulding or extrusion company for remanufacture into new plastic products (Luxus Ltd., 2014).

- Plastic recycling schemes

There are different plastic recycling schemes in the UK to promote and facilitate plastic recycling, such as “Recovinyl,” which provides financial incentives to support the collection of PVC waste; “Recofloor,” which mainly collects and recycles vinyl flooring and diverts it from landfill; and the “Vinyl Plus programme,” aimed at enhancing the recycling rates of PVC and developing innovative and advanced recycling technologies (British Plastics Federation, 2015).

Pros

The business-based education for plastic waste management in the UK aims at enhancing businesses’ awareness and behavior regarding plastic recycling and plastic waste management by using those services.

8.2.1.4 Hong Kong*Characteristics*

- Teacher’s guidebook

The government has published a teacher’s guidebook called “Reduce Your Waste and Recycle Your Plastics,” which provides the four steps of recycling

procedures and the rationale behind the steps (Environmental Protection Department, 2011).

- The “Reduce Your Waste and Recycle Your Plastics Campaign”

The Environmental Campaign Committee 2012¹ organized a campaign called the “Reduce Your Waste and Recycle Your Plastics Campaign” in Hong Kong schools in 2012, in which the participating schools encouraged their students to bring their plastic bottles to school after cleaning and removing the caps and labels from the bottles and put them into the recycling bin at school (Environmental Protection Department, 2015).

Pros

The teacher’s guidebook and the campaign aimed to “cultivate and sustain pupils’ behavioral change on waste reduction and recycling” and to provide them with knowledge of waste management (Environmental Protection Department, 2015).

8.2.2 Importance of Plastic Waste Education

Research studies have revealed that it is possible for education to change knowledge, attitudes, and behaviors. The studies of Mobley, Vagias, and DeWard (2009) and Olofsson and Öhman (2006) (as cited in Manning, 2010) support that “the level of formal education people have received seems to correlate directly with the amount of environmental knowledge people have and the formation of positive attitudes.” In addition, Scott and Willits (1994) (as cited in Manning, 2010) “also found that the more highly educated one is, the more likely one is to engage in environmentally responsible behaviors.” The current environmental education for plastic waste management adopted by Japan, Taiwan, the UK, and Hong Kong is still not perfect. There is still much room for improvement in order to change all of the knowledge, attitudes, and behaviors regarding plastic waste management, which depends on the effectiveness of the educational strategies.

8.2.2.1 Change in Knowledge

Some academics have defined education as a “potent weapon to help develop new knowledge, skills, and values for achieving a healthier environment and a higher quality of life” (Nagra, 2010; UNCED, 1992). Indeed, education is a process of teaching and learning, in which the learners acquire and know new facts, information, and values.

¹The Environmental Protection Department (EPD), the Environmental Campaign Committee (ECC), the Education Bureau (EDB) and the Yan Oi Tong EcoPark Plastic Resources Recycling Centre (YOT PRRC) formed the Environmental Campaign Committee 2012.

8.2.2.2 Change in Attitudes

Another environmental education's objective is to change people's attitudes by "helping social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection," defined by the 1977 Tbilisi Intergovernmental Conference on Environmental Education (Hungerford & Volk, 1980).

8.2.2.3 Change in Behavior

The 1977 Tbilisi Intergovernmental Conference on Environmental Education also defined that education can change behavior by "providing social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems and/or issues" (Hungerford & Volk, 1980).

8.2.2.4 Educational Strategies

To achieve the above changes, teaching strategies are critical for the learning outcomes. Traditional lectures have been reported to be less effective to affect behaviors in environmental-related topics due to the lack of interactive learning and thinking opportunities to students (Duerden & Witt, 2010). On the other hand, experiential learning is found to be more effective in empowering and engaging students to take part in environmental learning and actions (Sipos, Battisti, & Grimm 2008). There are no standard pedagogies developed specifically for teaching plastic waste management in schools. However, So and her colleagues (2014) suggested that inquiry learning approach (such as gaming activities or experimental investigation) could enhance students' knowledge, but the limited course time (70 min) was difficult to induce intended behavioral changes for plastic waste recycling education. More investigations should be studied for educational strategies in plastic waste recycling.

8.3 The Centre for Education in Environmental Sustainability's (CEES) Aim/Vision of Plastic Waste Education

CEES has been established since January 2013. The Centre's vision is to further develop effective environmental educational strategies and sustainability studies in Hong Kong through research and knowledge transfer networks with local, Chinese,

Table 8.2 Expected change in knowledge, attitude, and behavior toward plastic waste management induced by different education programs

		Education programs in Japan, Taiwan, the UK, and Hong Kong (not exhaustive)
Expected change in	Knowledge	<ul style="list-style-type: none"> • Publication and broadcasting (Japan) • Teacher's guidebook (Hong Kong) • The "Reduce Your Waste and Recycle Your Plastics Campaign" (Hong Kong)
	Attitude	<ul style="list-style-type: none"> • Legislation (Taiwan) • Plastic management and recycling companies (UK)
	Behavior	<ul style="list-style-type: none"> • Specific containers (Japan) • Voluntary activities (Japan) • Family education (Japan) • "Four-in-one" program (Taiwan) • Legislation (Taiwan) • Plastic management and recycling companies (UK) • Teacher's guidebook (Hong Kong) • The "Reduce Your Waste and Recycle Your Plastics Campaign" (Hong Kong)

and overseas universities. The mission of the centre is "to improve the understanding of environmentally related matters via education in environmental sustainability and to stimulate remedial actions through research and public education," as highlighted in the centre's slogan "Care for our Environment, and Educate our Students and Community" (CEES, EdUHK, 2015) (Table 8.2).

8.4 Plastic Waste Education Adopted by CEES

CEES has launched the 3Rs (reduce, reuse, recycle) education project with three different teaching strategies, i.e., direct teaching, hands-on teaching, and simulation game-based teaching strategies, attempting to enrich local primary school pupils' knowledge of environmental sustainability as well as pro-environmental attitudes and behaviors of plastic waste recycling.

Research question: How can educational strategies be used to enhance students' learning outcomes in terms of knowledge, attitude, and behavior?

8.4.1 Methodology

There were 61 pupils from seven local primary schools aged from 8 to 12, from grades 4 to 6, participating in this education project. They were divided into three

teaching groups to learn about plastic waste problems and plastic waste management in Hong Kong for 9 h (one-and-a-half-day course). Before and after the program, the pupils were given a pre- and post-test, respectively, to test their changes in knowledge, attitudes, and intended behaviors regarding recycling and plastic waste management. Quantitative data were collected with the prior consent received from pupils. All the statistical data were analyzed by the software SPSS ver.21 (IBM Corp., 2012).

8.4.1.1 Direct Teaching Strategy

The direct teaching strategy is about “teachers instructing students directly and assuming a highly structured, active, and dominant role in which teacher talk is relied upon to ensure that students interpret the work in the intended way and achieve the desired outcome” (Goodman, 1986). In the direct teaching sessions, the teacher presented plastic waste problems and management knowledge to pupils directly, mainly by using PowerPoint slides.

8.4.1.2 Hands-on Teaching Strategy

Hands-on teaching is a kind of inquiry teaching strategy, which “refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world” (National Research Council, 1996). In the hands-on teaching sessions, the teacher provided guidance for pupils to learn actively by observation, experiments, and interaction with the environment.

8.4.1.3 Simulation Game-Based Teaching Strategy

Simulation games “represent dynamic models of real situations (a reconstruction of a situation or reality that is itself a social construction)” (Kriz, 2003). Within a game-like context, pupils can experience in-person in the simulation of certain existing systems (i.e., instructive content). In the simulation game-based sessions, the teacher held a face-to-face simulation game called “plastic city,” in which the pupils were involved in a role play and acted as citizens of the city. By “living in the plastic city,” they can experience and understand more on the interconnections between their daily lives and environmental problems.

8.4.2 Results

8.4.2.1 Knowledge of the 3Rs and Plastic Waste Problems and Management

As shown in Table 8.3, all of the three groups' post-test scores for the knowledge of the 3Rs and plastic waste problems and management had a significant increase after the pupils went through either one of the teaching strategies. In other words, all of the three teaching strategies can enhance pupils' knowledge of the 3Rs and plastic waste problems and management. There was no significance found for the pre-test scores among the three groups for different teaching strategies on pupils' knowledge ($F = 1.938$; $\text{Sig.} = 0.153$), proving that the pupils from the three groups had a similar knowledge background before they underwent the teaching strategy.

As shown in Table 8.4, pupils who participated in the simulation game attained the most significant improvement in their knowledge of the 3Rs and plastic waste problems and management, when compared with those who were from the direct teaching group and the hands-on teaching group (Table 8.5).

In the test, the questions were divided into four different categories: plastic and waste, recycle, reuse, and reduce. For example, they included the knowledge of landfills in Hong Kong, plastic waste problems and management, and government policy. The post-test results revealed that the pupils from the simulation game-based teaching group achieved significantly higher scores than the other two groups in the category of plastic and waste, whereas there were no significant differences in the scores of the other categories among the three teaching groups.

8.4.2.2 Ecological Worldview Attitude

The results listed in Tables 8.6 and 8.7 indicate that there were no significant differences in the pupils' ecological worldview attitudes before and after the program for each teaching strategy. Nevertheless, the pupils from the hands-on

Table 8.3 Pre- and post-test scores for the knowledge of 3Rs and plastic waste problems and management

Teaching Strategies	N	Pre-mean	Post-mean	t-value	Significance p-value (2-tailed)
Direct	21	5.42 ± 1.56	7.90 ± 2.49	3.901	0.001**
Hands-on	19	5.36 ± 1.70	8.32 ± 2.71	5.321	0.000***
Simulation game-based	21	6.24 ± 1.04	10.48 ± 2.32	9.722	0.000***

** $p < 0.005$; *** $p < 0.001$

The full score is 15

Table 8.4 Comparison of the difference in the knowledge scores of the teaching groups

Teaching strategies	Mean dif. (post-pre)	SD	F	Sig.
Direct	2.28	0.67	3.493	0.038
Hands-on	2.87	2.29		
Simulation game-based	4.24*	2.00		

One-way ANOVA: *p < 0.05

Table 8.5 Pre- and Post-test mean score of the classified questions in different categories and teaching groups

Questions category	Full score	Post-test mean score ± SD		
		Direct	Hands-on	Simulation game-based
Plastic and waste	7	3.79 ± 1.27a	3.60 ± 1.30b	5.05 ± 0.97a, b*
Recycle	2	0.63 ± 0.60	1.13 ± 0.83	0.904 ± 0.77
Reuse	3	1.68 ± 1.00	1.60 ± 0.83	2.10 ± 0.94
Reduce	3	1.74 ± 0.73	1.53 ± 0.83	2.00 ± 0.77

One-way ANOVA

*Sig. = 0.004 for a and 0.002 for b

Table 8.6 Pre- and Post-test mean scores of the ecological worldview attitudes of the different teaching groups

Teaching strategies	N	Pre-mean	Post-mean	t-value	Significance p-value (2-tailed)
Direct	7	2.11 ± 0.34	1.91 ± 0.64	-0.85	0.429
Hands-on	9	2.211 ± 0.45	2.22 ± 0.41	0.098	0.924
Simulation game-based	19	2.04 ± 0.57	1.89 ± 0.74	-1.051	0.307

The full score is 5

Table 8.7 Comparison of the difference in the PEA scores of the teaching groups

Teaching strategies	Mean dif. (post-pre)	SD	F	Sig.
Direct	-2.00	6.24	0.34	0.72
Hands-on	0.11	3.41		
Simulation game-based	-1.53	6.33		

One-way ANOVA

teaching group had a slight improvement in their ecological worldview attitudes after the program and had slightly better performance in this part of the post-test than the other two groups (Table 8.8).

Table 8.8 Pre- and Post-test mean scores of the recycling attitudes of the different teaching groups

Teaching Strategies	N	Pre-mean	Post-mean	t-value	Significance p-value (2-tailed)
Direct	14	3.56 ± 0.36	3.50 ± 0.24	-0.715	0.487
Hands-on	10	3.52 ± 0.38	3.59 ± 0.50	0.633	0.543
Simulation game-based	21	3.54 ± 0.40	3.56 ± 0.37	0.279	0.783

The full score is 5

Table 8.9 Comparison of the difference in the recycling attitude scores of the teaching groups

Teaching strategies	Mean dif. (post-pre)	SD	F	Sig.
Direct	-0.64	3.37	0.44	0.65
Hands-on	0.70	3.50		
Simulation game-based	0.24	3.91		

One-way ANOVA

8.4.2.3 Recycling Attitude

In the tests, there were a series of questions asking about the recycling attitudes of the pupils. The results of the pre- and post-tests showed that there was no significant difference in the recycling attitudes of the pupils from each teaching group before and after the program. However, the post-test mean scores of the pupils from the hands-on group and simulation game-based group were slightly higher than the pre-test scores, indicating that there was a slight improvement, though insignificant, in recycling attitude for the pupils learning through hands-on teaching and simulation game-based teaching (Table 8.9).

8.4.2.4 Intended Behavior of Plastic Waste Recycling

The results in Tables 8.10 and 8.11 show that the pupils' intended behavior of plastic waste recycling and management did not change much after they had gone through the program, no matter which teaching group they had joined, with the hands-on group achieving a slight improvement in this aspect.

8.4.3 Discussion

In summary, all of the three teaching strategies can significantly enhance pupils' knowledge of the 3Rs and plastic waste problems and management, with the simulation game-based strategy being the most effective of the three strategies in

Table 8.10 Pre- and post-test mean scores of the intended behavior of the different teaching groups

Teaching strategies	N	Pre-mean	Post-mean	t-value	Significance p-value (2-tailed)
Direct	10	3.49 ± 0.68	3.20 ± 0.83	-1.891	0.091
Hands-on	10	3.15 ± 0.57	3.17 ± 0.57	0.069	0.946
Simulation game-based	16	3.15 ± 0.67	3.00 ± 0.75	-0.655	0.522

The full score is 5

Table 8.11 Comparison of the difference in the intended behavior scores of the teaching groups

Teaching strategies	Mean dif. (post-pre)	SD	F	Sig.
Direct	-3.80	6.36	0.41	0.67
Hands-on	0.20	9.14		
Simulation game-based	-1.94	11.83		

One-wayANOVA

this aspect, especially in the knowledge of the category of plastic and waste. Although the three teaching strategies did not make significant changes in pupils' ecological worldview attitudes, recycling attitudes, or behaviors in plastic waste recycling and management, the hands-on strategy achieved improvement in the pupils' ecological worldview attitudes and recycling attitudes and facilitated pupils' behavior in plastic waste recycling and management, although to an insignificant extent, while the simulation game-based strategy attained some enhancement in recycling attitudes as well.

The above results coincided with the literature review of different environmental education studies, which also suggested a number of elements which were associated with those teaching methods that led to those desired outcomes of environmental education (Stern, Powell, & Hill 2014). The benefit of direct teaching is that it involves school teacher engagement so that teachers with their own verbal and nonverbal communication styles act as role models in developing pupils' environmental literacy. The benefit of hands-on teaching is that it is experiential. That is, pupils can actively participate in a particular firsthand experience, which develops their skills and perceptions of self-efficacy. The benefit of simulation game-based teaching is that it allows pupils to have active and experiential engagement in real-world environmental problems (Stern et al., 2014).

One recommendation for the CEES study is to lengthen the time duration of the study for the sake of facilitating more significant changes in pupils' attitudes and behaviors (So 2014). Pupils could acquire new knowledge through either one of those teaching strategies easily in a short time, whereas it takes more time for their attitudes and behaviors to undergo significant change as they may already have inherent habits. Therefore, more time and human resources should be allocated to hands-on teaching and simulation game-based teaching, which are labor intensive and time-consuming, so as to change pupils' attitudes and intended behavior to a more significant extent. Also, some more education tools should be used.

For example, it was reported that the innovative 8-compartment plastic recycling bin (PRB) invented by CEES together with a poster and course intervention can facilitate pupils' change in knowledge and intended behavior (Chow, Cheng, Cheung, & So 2015).

8.5 Conclusion and Future Perspectives

To conclude, plastic waste problems are becoming increasingly serious all around the world. To cope with the situation, education is of the essence. Different countries have different education foci, but there is still room for improvement to change all people's knowledge, attitudes, and behaviors regarding plastic waste management. CEES has adopted three different teaching strategies, which are the direct teaching, hands-on, and simulation game-based strategies. It was found that all these three teaching strategies can significantly improve pupils' knowledge, while the hands-on and simulation game-based strategies can facilitate attitudes and behavior, though insignificantly. Therefore, it would be good if the PRB is to be employed as well as allocating more time and human resources to the hands-on and simulation game-based teaching strategies so as to facilitate more significant changes in pupils' attitudes and behaviors regarding plastic waste management.

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Chapter 9

An Interactive Conceptual Approach to Support the Teaching and Learning of Green Technology

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Abstract Most students are used to memorizing formulas without fully understanding the fundamental principles when they are studying science-related subjects. This phenomenon is also common in learning green technology in both tertiary education institutions and secondary schools, especially in large class-sized situations. It is a daunting challenge for the teachers to assess whether the students really understand the topics taught or whether they simply apply the equations they have memorized to get the right answers. This project proposed the development of a teaching kit consisting of components to enable students to build different green technology systems, thereby facilitating learning. The prototypes of teaching kit with different topics (i.e. green technology, renewable energy, and water treatment) were designed and fabricated as an interactive conceptual approach to facilitate the understanding of the fundamental theories. By using the universal building components of the kit, students have to create their own models based on the selected topics. This approach enables the students to connect conceptual ideas to the physical systems in a more direct and meaningful way. The proposed approach and prototypes were successfully applied to facilitate students' understanding of the concepts of green technology. An evaluation was conducted before and after the trial programme, and most of the respondents agreed (students, $n = 316$; teachers,

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n = 18) that the teaching kit and associated activities could effectively enhance and facilitate the teaching and learning of green technology through the tailor-made teaching kits.

Keywords Green technology · Teaching kits · Model development

9.1 Introduction

Education and awareness-raising are usually the first step to arouse people's interest, motivation, and concern for environmental protection and management. Environmental education has been implemented in Hong Kong for more than 20 years and can foster environmental citizenship among the younger generation in Hong Kong, which in turn builds a future base of bottom-up support for positive conservation policies. Recently, the promotion of students' lifelong environmental awareness is particularly addressed in the environmental policy of the local educational department (Education Bureau [EDB], 2013). Environmental sustainability is an interdisciplinary subject and is also related to science education. It is an undeniable fact that green technology is an essential element in the areas in environmental sustainability and education that schoolteachers should pay attention to. In these years, the relevant environmental topics, including environmental monitoring and green technology, have been systematically incorporated into the formal and informal educational platforms through cross-curricula approach, school-based development plan, or action-oriented extracurricular activities beyond the curriculum. Thus, it is very essential for teachers to understand the importance of how to use advanced methods to teach students about environmental knowledge and get feedback from them.

Technology-enhanced learning is particularly important in both environmental and science education because it is featured with the unique use of laboratory-based activities for developing students' science process skills. Laboratory-based activities and demonstrations are well known to be a fundamental and indispensable part of science learning (Hofstein & Mamlok-Naaman, 2007) and have a constructive effect on teaching of science-based and/or technology-based subjects because they can help students develop their better understanding of science concepts by linking theories to actual practices, develop their hands-on instrumental skills, and simulate their interests and motivation of learning (Hodson, 1996; Abrahams & Reiss, 2012). The effectiveness of experimentation in science-related teaching and learning is recognized as a crucial way of combining knowledge and creativity to evaluate and explain scientific principles, theories, or hypotheses (Abrahams & Reiss, 2012; Hofstein & Lunetta, 2004). Furthermore, hands-on activities contain investigatory learning contexts that are considered to be a constructivist-based approach to developing deeper understanding of theoretical concepts (Hart, Mulhall, Berry, Lougharn, & Gunstone, 2000; Hofstein & Mamlok-Naaman, 2007).

Teaching green technology involves mathematical formulas and scientific theories. This can be challenging as students often find difficulties with such dry topics, resulting in ineffective learning (Wieman, 2007). Some studies suggest the importance of hands-on experiments in teaching laboratory-based science subjects, because students could truly involve in actual experiments and observe the non-intuitive phenomena. Students could further formulate and evaluate the explanations from the experimental results (Thornburg, 2009; Varma, Volkmann, & Hanuscin, 2009). The major objective of this project is to improve student learning in the area of green technology. Through the development of an interactive conceptual approach on both formal and informal classroom learning, students' interest in learning concepts and practices of green technology could be maximized. This project also encourages and supports the teaching and learning of green technology in tertiary education institutions and secondary schools in Hong Kong. In addition, the developed teaching kit can renovate the practice of teaching green technology by allowing students to design and conduct experiments and/or projects by themselves.

9.2 Methodology

In this study, an interactive teaching kit, including formal and informal classroom learning, was designed and developed, and several trial programmes (seminar and workshop) were conducted to facilitate the secondary school students and teachers to learn and understand the concepts and practices of green technology. Through the creations of green technology models in the trial workshops, the effectiveness of the proposed teaching kit and associated activities was then evaluated. Finally, the proposed teaching kit was modified based on the comments from participating students and teachers in order to support the teaching and learning of green technology in relevant curricula. The findings from this project were also uploaded onto faculty Website and disseminated to the secondary school sector through the teaching and learning activities in our platform.

The prototypes were adopted in the teaching and learning in green technology in Semester 2 of 2013/2014 for the courses, namely environmental science and liberal studies, in terms of laboratory-based activities in a tertiary education institution [i.e. The Education University of Hong Kong (EdUHK)] and a secondary school (i.e. Lee Kau Yan Memorial School), respectively. The design of the teaching kit was tailor-made based on the course contents and student needs in different educational institutions. The production of the prototypes (i.e. 2 systems for water treatment; 2 systems for renewable energy; and 2 systems for green technology) was completed by the end of January 2014. The photographs of the teaching kit prototypes are shown in Fig. 9.1. Visits were conducted for face-to-face discussion about the development and enhancement of proposed teaching kit from January to February 2014.

There are two target groups who are junior secondary school students and secondary school teachers in this study. Two different target groups represent the impact of the teaching kit on the teaching and learning of green technology with

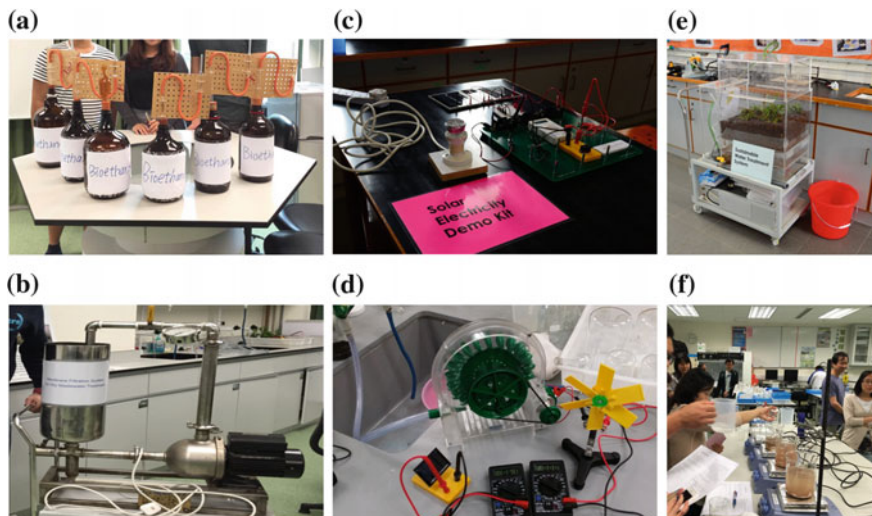


Fig. 9.1 Photographs of the teaching kit prototypes, **a** bioethanol production; **b** membrane filtration; **c** solar energy; **d** wind–water–energy; **e** biofiltration with plant; and **f** coagulation–flocculation

different education levels. All participating students were junior secondary school students from Lee Kau Yan Memorial School to avoid the difference of background knowledge on the topic of green technology. In-service teachers and technicians in secondary schools with a different expertise were randomly invited to join the trail programmes to obtain the comments and feedbacks from the front-line staff regarding the effectiveness of the proposed teaching kit.

The trial programmes, including 2-hr seminar (theoretical) and 3–4-hr experiential and interactive workshop (experimental), were organized for (I) Lee Kau Yan Memorial School’s students and teachers; (II) in-service teachers who joined Student Environmental Protection Ambassador Scheme 2013/2014—Environmental Training Workshop organized by EdUHK; and (III) in-service teachers and technicians in secondary schools who joined the professional training programme supported by the Knowledge Transfer Funds of EdUHK in February, March, and April 2014, respectively. The seminars were designed and organized for participants with the basic concepts and up-to-date information related to water treatment, renewable energy, and green technology. Apart from seminars, the interactive workshops to exchange innovative ideas and current concerns in green technology were organized for teachers and students to introduce scientific ideas through the emphasis on technological implementation. Some demonstrations and uses of the prototypes were displayed and conducted. Some activity manual templates were also prepared for teachers as a reference.

Questionnaire surveys were conducted before seminar and after the workshop to compare and evaluate the effectiveness of the developed teaching kit and trial programmes. The questionnaire was divided into three sessions: before the programme, after the seminar, and after the workshop. The questionnaire consists of six parts in first-round workshops, namely (1) three items on the respondents' background knowledge before participating in the trial programmes, (2) six items on the evaluation of respondents' learning experience in the seminar, (3) six items on the evaluation of respondents' learning experience in the workshop, (4) the evaluation of respondents' overall learning experience in the programme, (5) the respondents' demand for similar programmes, and (6) an open-ended question to collect respondents' opinions and feedbacks on the programme. Regarding the questionnaire survey for teachers, not only the evaluation of respondents' learning experience, but also the evaluation of respondents' opinion on teaching effectiveness of the proposed teaching kit was included. The questionnaire was modified from students' questionnaire. Questionnaire consists of six parts with some addition items, namely (1) two items on respondents' prior techniques on science education, (2) three items on the evaluation of respondents' opinion on teaching effectiveness of the seminar, (3) three items on the evaluation of respondents' opinion on teaching effectiveness of the workshop, (4) three items on the evaluation of respondents' overall opinion on teaching effectiveness in the programme, (5) the respondents' demand for similar programmes (same as student's version), and (6) two open-ended questions to collect respondents' opinion and feedback on the teaching effectiveness of the programme. Both sets of questionnaires were utilized 5-point Likert scale (with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree) to determine and evaluate the change of attitudes towards teaching and learning of green technology between teacher and students in different stages of the whole programmes.

9.3 Results and Discussion

The prototypes, which include different topics (2 systems for water treatment; 2 systems for renewable energy; and 2 systems for green technology), were designed and fabricated, and can be used as an interactive conceptual approach to support the teaching and learning of green technology and to facilitate the understanding of the fundamental concepts with the use of the proposed teaching kit and programmes. By using the universal building component in the teaching kit prototypes, students have to create their own models based on the selected topics or theories.

According to the results of questionnaire surveys conducted in the two separated trial programmes, 316 questionnaires from students and 18 from teachers were collected with the return rate of 87.8 and 81.8%, respectively. Nine items were rated by the 5-point Likert scale to evaluate the respondents' evaluation of their learning

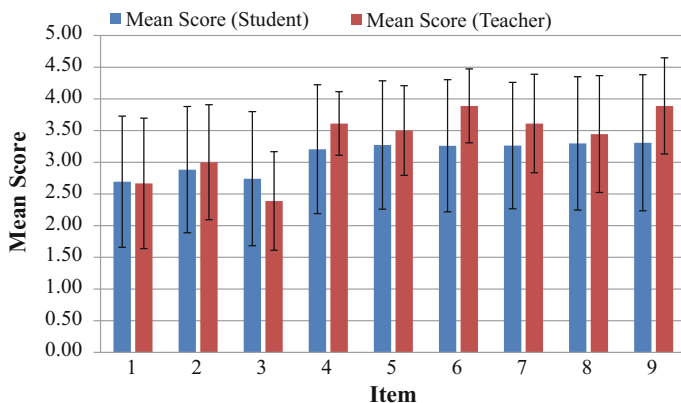


Fig. 9.2 Mean score of the respondents' evaluation of learning of green technology in students' and teachers' trial programmes

experience in the trial programmes with the Cronbach's reliability = 0.95 and 0.94 for students and teachers, respectively. The statement and mean score (Fig. 9.2) of each item and its standard deviation (SD) are shown in Tables 9.1 and 9.2, while the qualitative data collected from the open-ended questions are summarized in Tables 9.3 and 9.4, respectively. The results of three additional items related to the effectiveness of teaching green technology from the questionnaire survey of teachers' programme are shown in Table 9.5.

The results of normality test indicated the collected data were not of normal distribution; therefore, Wilcoxon pair t test (one-tail) was conducted to determine the significance of the items between pretest and post-test (Reimann, Filzmoser, Garrett, & Dutter, 2008). Generally, the results indicated that the interactive conceptual approach using the proposed teaching kit and associated activities could enhance the teaching and learning of green technology for both students and teachers who joined the trial programmes. As shown in Table 9.6, the average scores of respondents' seminar pretest and post-test are significantly different ($p < 0.05$); however, there is no significant difference between workshops' pretest and post-test scores ($p > 0.05$). The results showed that the seminar session could effectively enhance both students' and teachers' knowledge of green technology, renewable energy and water treatment. This finding may be due to time constraints of workshop for three different topics. The participating teachers cannot go into detail of these topics within 4-hr workshops and more diverse education backgrounds of teachers.

As shown in Fig. 9.2, the mean scores of items 4–9 from teachers programme are generally greater than that of students programme. This result may be due to the different education level of the knowledge. Most of the teachers (72.2% of

Table 9.1 Combined results of the respondents' evaluation of learning of green technology in student trial programme

Item	Statement	Mean (SD)
1	Before joining this programme, I fully understand what green technology is	2.69 (1.03)
2	Before joining this programme, I fully understand what renewable energy is	2.88 (1.00)
3	Before joining this programme, I fully understand what water treatment is	2.74 (1.06)
4	After attended the seminar, I fully understand what green technology is	3.21 (1.02)
5	After attended the seminar, I fully understand what renewable energy is	3.27 (1.01)
6	After attended the seminar, I fully understand what water treatment is	3.26 (1.04)
7	After attended the workshop, I fully understand what green technology is	3.26 (1.00)
8	After attended the workshop, I fully understand what renewable energy is	3.30 (1.05)
9	After attended the workshop, I fully understand what water treatment is	3.31 (1.07)

Table 9.2 Combined results of the respondents' evaluation of learning of green technology in teacher trial programme

Item	Statement	Mean (SD)
1	Before joining this programme, I fully understand what green technology is	2.67 (1.03)
2	Before joining this programme, I fully understand what renewable energy is	3.00 (0.91)
3	Before joining this programme, I fully understand what water treatment is	2.39 (0.78)
4	After attended the seminar, I fully understand what green technology is	3.61 (0.50)
5	After attended the seminar, I fully understand what renewable energy is	3.50 (0.71)
6	After attended the seminar, I fully understand what water treatment is	3.89 (0.58)
7	After attended the workshop, I fully understand what green technology is	3.61 (0.78)
8	After attended the workshop, I fully understand what renewable energy is	3.44 (0.92)
9	After attended the workshop, I fully understand what water treatment is	3.83 (0.76)

Table 9.3 Consolidated opinions and feedbacks of the open-ended question from student survey

Question aspect	Opinions or feedback
Advantages	<ul style="list-style-type: none"> • Information of sewage treatment plant is attractive • Students are interested in wastewater treatment
Problems on workshops	<ul style="list-style-type: none"> • English presentation is difficult for them
Suggestions	<ul style="list-style-type: none"> • Workshop should not hold before the school examination • Secondary three students would like to visit sewage treatment plant • Grateful if much more teaching kits and games are demonstration during the workshop

Table 9.4 Consolidated opinions and feedbacks of the open-ended question from teacher survey

Question aspect	Opinions or feedback
Advantages	• Introduction of water treatment processes was appreciated
Problems on workshops	None
Suggestions	• The topics could match with the curriculum of DSE • Site visits could be organized

Table 9.5 Combined results of the respondents' evaluation of teaching and learning of green technology in teacher trial programme

Item	Statement	Mean (SD)
A1	Contents of the programme could enhance the knowledge for teaching green technology	3.61 (0.61)
A2	Contents of the programme could enhance the skills for teaching green technology	3.50 (0.51)
A3	Contents of the programme could facilitate the learning and learning of green technology	3.61 (0.70)

Table 9.6 P-value of pretest and post-test for 2 group respondents

Statement	p-value
Students' knowledge against green technology was significant enhanced after seminar	3.524×10^{-16}
Students' knowledge against renewable energy was significant enhanced after seminar	8.097×10^{-12}
Students' knowledge against water treatment was significant enhanced after seminar	2.181×10^{-14}
Students' knowledge against green technology was significant enhanced after workshop	0.1202
Students' knowledge against renewable energy was significant enhanced after workshop	0.3554
Students' knowledge against water treatment was significant enhanced after workshop	0.1658
Students' knowledge against green technology was significant enhanced after seminar	0.0018
Teachers' knowledge against renewable energy was significant enhanced after seminar	0.0257
Teachers' knowledge against water treatment was significant enhanced after seminar	0.0002
Teachers' knowledge against green technology was significant enhanced after workshop	0.5562
Teachers' knowledge against renewable energy was significant enhanced after workshop	0.7245
Teachers' knowledge against water treatment was significant enhanced after workshop	0.5464

respondents) are from the science stream (i.e. physics, chemistry, biology or integrated science) and had enough training in fundamental concepts of green technology. Therefore, these teachers could understand the theories of green technology more easily. However, all participating students are the junior secondary school students, who may have not enough fundamental knowledge of the topics discussed in the programme.

Through the workshops (formal classroom learning) and model-making process (informal classroom learning), the implementation of this interactive conceptual learning approach can enhance and facilitate student learning, help students to organize thoughts, picture the sequence of events of theories, and understand fundamental concepts without forcing to memorize formulas or equation, instead of just memorizing all materials for examinations. Through the creation of their own models, students are provided with encouraging environment to exchange ideas, compare design, and access more detailed information about green technology. On the other hand, comparing with the fixed and illustrative experimental set-ups commonly used in the laboratory, the flexible universal component of the teaching kit prototypes can result in something new every time with the creativities of students. The project is getting on well, and the expected objectives have been achieved. Based on the findings, the proposed teaching kit had been found as an effective education tool for teaching and learning of green technology; hence, it is a new way of conducting laboratory work and student projects in environmental sustainability. Deliverables indicating the usefulness of active learning in green technology's theories and practices were uploaded onto the EdUHK platform for public sharing of findings. The continual improvement of teaching and learning of green technology was also achieved by the stakeholders' comments collected through different means.

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Chapter 10

The Unconventional Learning Experience of Students—Becoming a Courier of Marine Stewardship

Chi-Chiu Cheang, Cheuk-Fai Chow and Lincoln Fok

Abstract This chapter is to, through an unconventional field-based and service-based education programme for undergraduates studying in the Education University of Hong Kong (EdUHK), determine whether self-contained underwater breathing apparatus (scuba) diving in association with relevant training on marine conservation is an effective teaching intervention for environmental education. The aim of this programme was to promote participants' action competence in marine conservation and protection. A team of seven undergraduate students, enrolled in the programme entitled Courier of Marine Stewardship at the EdUHK (Courier MS EdU), were trained with knowledge about marine conservation and protection, and basic skills in undertaking an underwater ecological study. Upon completion of their training, the team transferred their knowledge and experiences through educational talk to local pupils and participated in community services of Reef Check Hong Kong 2015 and seabed cleanup. Based on a post-programme interview of the team members, this programme was found to have enhanced participants' acquisition of solid knowledge and positive values through first-hand unconventional learning experience, which in turn strengthen their action competence in conserving and protecting the ocean. The difficulties in organizing such unconventional programme included financial and logistic constraints, risks associated with diving, and leisurely expectation of the students which hindered the cognitive and attitudinal outcomes of this field-based activity.

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Keywords Community service • Knowledge transfer • Marine conservation and protection • Scuba diving • Seabed cleanup • Unconventional learning experience

10.1 Introduction

10.1.1 *Marine Conservation, Protection and Environmental Sustainability*

Ocean covers over 70% of the Earth's surface. Marine ecosystems in the ocean and associating coastal areas account for the provision of numerous important ecosystem goods and services to the mankind, including the provision of food, climate regulation, supporting nutrient cycling and supporting non-commercial uses by human (Worm et al., 2006). A recent study estimated that the total value of ecosystem services provided by the marine biome was US\$49.7 trillion in 2011, equivalent to approximately 66% of the world's gross domestic production of the same year (Costanza et al., 2014). The bloom of human population in the last century, however, has posed various threats to global biological diversity and life-support systems (Rands et al., 2010). Marine ecosystems are increasingly impacted by the loss of biological diversity due to anthropogenic exploitation and activities that consequently altered the regular functioning of the systems (Worm et al., 2006). Such degradations of ecosystem services are often manifested as environmental issues chanted in the mass media, which are usually detrimental to human societies. The modern ecological paradigm, as a result, emphasizes the concept of sustainable development. And it is suggested that environmental sustainability in particular should become one of the core values in contemporary communities (Goodland, 1995). Obviously, this cannot be achieved by repression, but only be accomplished by touching awareness, especially of young people. And education represents one of the major and most important channels to mainstream this core value in our society.

10.1.2 *Environmental Education and Related Pedagogy*

Despite the recent discussion on the terminological replacement of environmental education (EE; see Kopnina, 2014), EE has long been recognized as an important discipline “to develop a world population that is aware of and concerned about the environment and its associated problem” (Barry, 1976). The objectives of EE are to enhance awareness, knowledge, attitude, skill, evaluation ability and participation of communities on environmental issues. The development of pro-environmental behaviour (PEB), which is “the behaviour that consciously seeks to minimize the negative impact of one's actions on the natural and built world” (Kollmuss &

Agyeman, 2002), is the benchmark for assessing the effectiveness of EE. The conventional school-based approach, however, has been criticized as inefficient in the promotion of PEB (Barrett, 2007).

The early model of how PEB is acquired highlighted the role of one's pro-environmental attitudes as a mediator between the environmental knowledge and actual PEB. But this linear model received considerable amount of criticisms, and many studies failed to find a link between pro-environmental attitude and behaviour (Kollmuss & Agyeman, 2002). Instead of merely advocating a change in human behaviour, Jensen & Schnack (1997) suggested that EE should rather orient towards acquisition of one's action competence. According to Jensen (2002), an "action" refers to a change of lifestyle in every circumstance in the community. While the term "action competence" should be distinguished from behavioural modification or change commonly found in EE studies (Mogensen & Schnack, 2010). The main difference is that "action" is solely associated with an intention, while behavioural modification can be influenced by peer pressure or other factors. Thus, the consequences of one's action must be thoroughly realized (Jensen, 2002). Jensen & Schnack (1997) have also pointed out the positive relationship between experience accumulation and action competence. This implies that the acquisition process of action competence is highly learner-oriented and experience based.

Stimulated by the Dewey's call for "learning by doing", experiential approach to education emphasizes the predominant role of experience in the learning process. Kolb (1984) provided a learning cycle framework which involves the four basic steps, namely act, reflect, conceptualize and apply. This approach has, in fact, provided the theoretical background and the promising pathway for the development of action competence of a person (Georgopoulos, Birbili, & Dimitriou, 2011).

As one type of experiential learning, field-based education is an effective pedagogy for experience accumulation of learners. This approach has been proven to be more effective, in particular, in the teaching and learning of biological and environmental subjects than conventional classroom approach (e.g. Zoldosova & Prokop, 2006; Easton & Gilburn, 2012; Sukhontapatipak & Srikosamatara, 2012). This is so effective because the field provides students authentic experiences in the natural environment, allowing them to witness the reality rather than studying from secondary information sources such as textbooks and museums. This experience can actually maximize students' affective learning outcomes that are emotional in nature and long-lasting (Easton & Gilburn, 2012). Moreover, field exercises can deepen participant's understanding of various complex scientific concepts and enhance content-related problem solving ability (Manzanal, Rodríguez Barreiro, & Casal Jiménez, 1999).

Similar to field-based approach, service learning approach emphasizes on providing authentic learning opportunities to learners through community services (Zlotkowski, 1998). It has been commonly adopted in higher education of academic fields such as health sciences, social work and marketing (Petkus, 2000; Dorsey, 2001). Silcox (1993) reported the first environmental monitoring service provided by a group of American students to a Russian city, Novgorod. Johnson-Pynn and Johnson (2005) conducted a study on two explorative service learning-based EE

programmes in East African countries, and they found that not only the conservation knowledge but also the community awareness of the local participants has been greatly improved. Since then, more and more similar programmes have been implemented around the world, elucidating the role of service learning in EE (Johnson, Johnson-Pynn, & Pynn, 2007; Schneller, 2008; Al Barwani, Al-Mekhlafi, & Nagaratnam, 2013).

Although action-based, experiential, field-based and service-based learning approaches were proven to be effective pedagogies in EE, most of the teaching and learning activities of these approaches are conducted in terrestrial environments (*cf.* Bogner, 1998; Johnson-Pynn & Johnson, 2005; Easton & Gilburn, 2012; Sukhontapatipak & Srikosamatara, 2012). The field-based learning activities for EE on marine environments, in contrast, are relatively scarce (e.g. Lisowski & Disinger, 1991; Erickson, 1994; O'Connor & Sharp, 2014). These had prompted the authors to develop an EE module in this area.

10.1.3 Scholarship of Learning and Teaching (SoLT) and the Education Programme “Courier MS EdU”

An important issue in higher education is to create significant learning experience for students (Fink, 2003), which should be cross-disciplinary in nature (McKinney, 2013) and be sustained lifelong (Boyer, 1990). Enhancing students' learning experience is one of the core themes in the framework of SoLT discussed in chapter one (Fig. 1.1). The essence of various pedagogies discussed so far, in fact, is to enrich students' learning experience in environmental education. The field-based and service-based approaches adopted in the current study could allow students to expose themselves to various learning experiences. The action-based pedagogy, on the other hand, could strengthen students' self-initiative to learn, and bring a student-focus element into the pedagogy (Trigwell, Martin, Benjamin, & Prosser, 2000). Through practicing critical thinking and logical reasoning, students' pro-environmental behaviours can be enhanced and sustained.

Aiming to promote marine protection and conservation in Hong Kong, Department of Science and Environmental Studies and Centre for Education in Environmental Sustainability (CEES), of The Education University of Hong Kong (EdUHK) organized an education programme entitled Courier for Marine Stewardship of the EdUHK (Courier MS EdU) in 2015. This 6-month programme aims to train a diving team of undergraduates of the institution through action-based, field-based and service-based learning pedagogies. After the training, the participants are required to transfer their knowledge related to the local marine environment, the threats and approaches for conservation to local schools and the public. The participants assumed a dual role as a learner as well as an educator, and they were expected to acquire relevant knowledge and skills, a positive attitude and action competence related to the marine conservation.

10.2 The Research Question and Methodology

The objective of this paper is to determine whether self-contained underwater breathing apparatus (scuba) diving, in association with relevant training on marine conservation, is an effective teaching intervention for environmental education, through reporting the participants' self-conceived changes in knowledge, skill and attitude towards marine conservation, and an objective assessment on their action competence upon completion of the education programme "Courier MS EdU". This study is to test the hypotheses that awareness of participants on the need of protecting and conserving our marine ecosystem, and thus, their action competence towards a sustainable world, would be strengthened through acquisition of first-hand unconventional learning experience.

10.2.1 Overview of "Courier MS EdU"

A team of seven undergraduates were openly recruited in the EdUHK. They are all certified open water scuba divers. One of the criticisms of the field-based learning approach involves the overemphasis of the affective, over the cognitive learning outcomes (Lisowski & Disinger, 1991). In the light of this, background knowledge on marine protection and conservation were delivered by conventional means to the participants in the beginning of the programme (Fig. 10.1).

There were several specific learning outcomes of the programme. Cognitively, the team members were expected to understand the ecological importance of hard corals and coral reef; and what kinds of ecosystem functions were provided by them. It was anticipated that the members could master the skill of scuba diving, in situ identification of marine lives and be able to share their experience and present in front of a crowd of students. Most importantly, they could adopt a more environmental-friendly attitude towards the marine environment, realizing what kind of behaviour would be harmful to the marine environment and the reasons underneath.

To achieve the aforementioned outcomes, the programme was divided into three phases. In Phase 1, programme objectives and background knowledge in the local

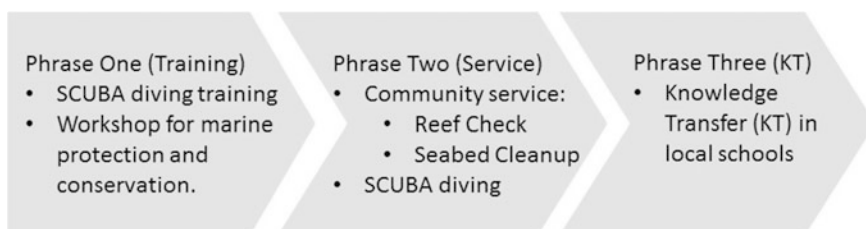


Fig. 10.1 Illustration of the education programme "Courier MS EdU" with the three main phases

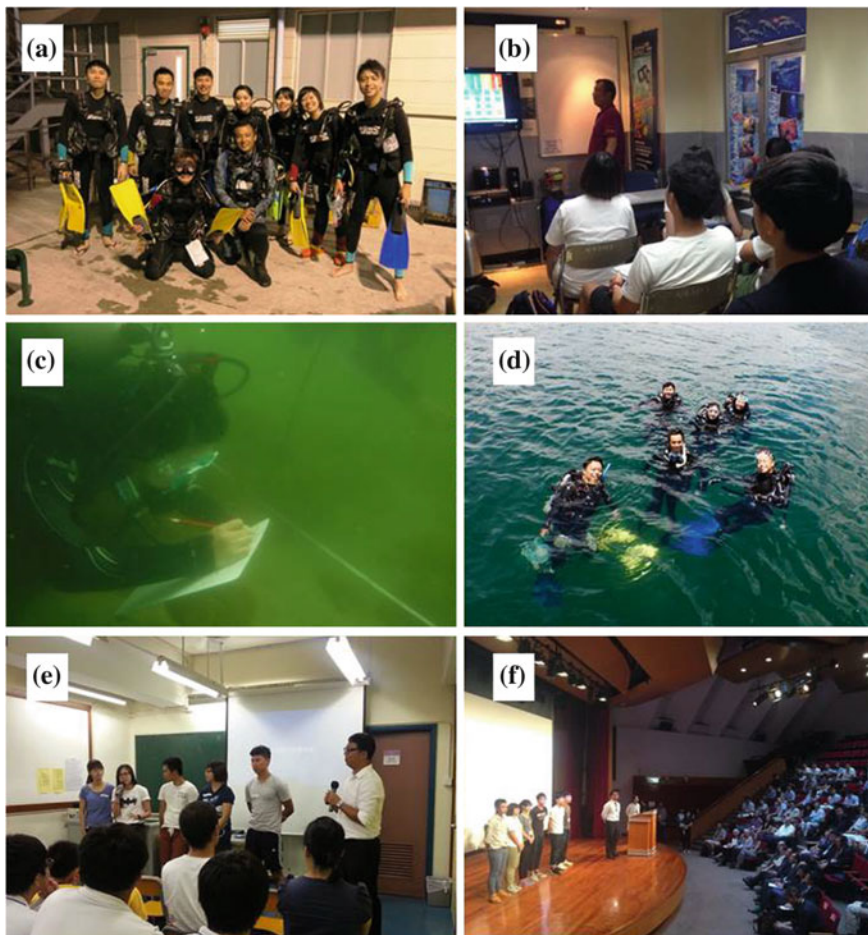


Fig. 10.2 Team members (a) receiving scuba diving training in the pool session and (b) attending the training lecture and workshop; (c) Team member conducting underwater ecological survey for Reef Check 2015; (d) Diving team having the field practical for seabed garbage collection. Experience sharing of the team in (e) a local secondary school and (f) the International Conference on Underwater Science, Technology and Education 2015

marine conservation were introduced in a workshop, which covered topics related to marine ecology of Hong Kong, basic identification of marine lives, anthropogenic threats faced by these organisms, the current status of marine conservation and protection in Hong Kong and methods of underwater ecological survey. This was followed by a scuba diving course focused on skills involved in undertaking an ecological study in an underwater environment (Fig. 10.2a, b).

Upon completion of the training, the team took part in community services in Phase 2. One major community services that the students have joined is the Hong Kong Reef Check 2015, which was organized by the Reef Check Foundation and the Agriculture, Fisheries and Conservation Department (AFCD) of the Hong Kong SAR Government. Reef Check Hong Kong, being a subordinate event of Reef Check Worldwide (<http://www.reefcheck.org/>), is an annual event which recruits volunteer teams from local universities, consultancy firms, commercial diving clubs and government departments to conduct standard ecological survey in assigned locations (Fig. 10.2c). The ecological data set collected from the coral community in Hong Kong waters would be sent to Reef Check Worldwide, which manages a global database as an effort to monitor deterioration of the coral reef around the world. Besides Reef Check, the team members have carried out seabed cleanup in one of the famous diving site in Sai Kung, Hong Kong (Fig. 10.2d). The garbage collected was sent to a laboratory in the EdUHK for further chemical analysis and scientific researches.

In Phase 3, the team transferred their knowledge and experience through delivering educational talk and experience sharing in local schools. On top of the general overview of the Hong Kong marine environment, the team members introduced and discussed the concept and importance of marine biodiversity conservation in Hong Kong to the local secondary students (Fig. 10.2e). To allow further exposure and accumulation of more experience on public speech, the team members joined the International Conference on Underwater Science, Technology and Education 2015 which was held in the City University of Hong Kong on 20 August 2015. In this event, the team shared what they have learnt in the programme (Fig. 10.2f).

10.2.2 Research Instrument and Analysis

Qualitative approach was adopted in the current study to investigate the effectiveness of the Courier MS EdU programme. Semi-structured individual interviews of about 30–40 min each were conducted on all the diving team members. Written consents were obtained before commencement of the interviews, in which audio recordings were conducted and transcribed.

The interview questions were designed to assess the perceived changes on knowledge (and skill), attitude and behaviour (KAB) of the team members after the programme. Motivation of the students to the programme was investigated. The responses about field experience, impression with scuba diving and community service were particularly collected in order to determine the effectiveness of this programme.

Table 10.1 The codes of conduct for the marine park visitors

Marine park visitors' codes	Codes for scuba divers and snorkellers to visit the coral sites
M1. Do not dig up the sand and rubbles	D1. When a dive boat is used to transport divers to the coral sites,
M2. Do not overturn stones and boulders	D1A. do not drive into too shallow water;
M3. Do not hurt or disturb any marine wild life	D1B. do not anchor outside the designated anchoring area;
M4. Do not stand on the corals	D1C. tie up the boat to the green mooring buoy provided if necessary;
M5. Do not collect any live or dead specimens (it is suggested to take photographs or video as records)	D1D. Dive boats should not pass over diving areas in radius of 15 metres from bubbles.
M6. Do not litter	D2. When diving in the water, do not touch, walk, sit or lie on the coral.
M7. Do not pollute water bodies	D3. Avoid scuba diving training on coral sites.
M8. Respect our marine environment	D4. If a scuba diver cannot master buoyancy control, he should avoid diving on the coral site, in particular the shallow coral site (less than 2 m). However, diving along the periphery of the coral site in deeper waters is allowed.
M9. Avoid diving in the coral area before you can master your buoyancy properly	
M10. Do not anchor outside the anchoring areas	
M11. Listen and follow the advice of marine parks' warden	

(Source AFCD)

To evaluate the action competence of the participants objectively, the participants were asked to read the marine park visitors' code and codes for scuba divers and snorkellers to visit the coral sites (AFCD, Table 10.1; last accessed on 14 August 2015, available at https://www.afcd.gov.hk/english/country/cou_vis/cou_vis_mar/cou_vis_mar_mpv/cou_vis_mar_mpv_act.html) during the interviews. The codes of conduct were not given to the students before this evaluation exercise, and yet the theoretical information related to the codes has been introduced during the lectures and workshops in Phase 1. After reading a total of 18 visitor codes, the members were requested to indicate their willingness to follow the codes, and, more importantly, to explain the theoretical background of the codes underneath. The number of codes that the participants indicated to follow with valid justifications was regarded as a measure of action competence with regard to protection and conservation of the marine environment.

Content analysis (Neuendorf, 2002) was used to summarize the team members' response to the questions (data set) collected. The data set were coded and reduced according to the key messages expressed (Miles & Huberman, 1994), and they were categorized into knowledge, attitude and behavioural domains. For the analysis of action competence, descriptive statistic was adopted to show the number of activities codes that would be followed by the participants with valid justification.

10.3 Results

10.3.1 Reasons for Joining the Programme and the Most Impactful Experience

All the participants completed the interview. They have diverse backgrounds: four of them were pursuing bachelor's degree in environmental-studies-related programmes, and the other three were studying physical education or sports sciences. The reasons why they took part in the programme included the attraction of the scuba diving, the desire to learn new knowledge, the curiosity about the ocean and the drive to put environmental knowledge learned into practices. Some participants indicated that scuba diving is a professional sport, and the rarity of scuba diver among their peers motivated them to join the programme. Regarding the adventure nature of scuba diving as an attraction to the participants, only one diving team member suggested that scuba diving is an adventure to him. One member, who has frequently carried out water sports, indicated that scuba diving has not possessed much adventurous impression to him.

Four members reflected that scuba diving experience is the most impactful experience provided by the education programme. Among those four, one particularly pointed out that the underwater world has inspired her so much. One member referred to her strong sense of self-achievement after completing the challenging scuba diving training course. Besides, one member mentioned that his experience in knowledge transfer activities was wonderful, as he could assist in motivating more teenagers from local school to join the scuba diving sport and spread conservation messages to others.

10.3.2 Improvement on Knowledge, Attitude and Behaviour (KAB)

All members perceived that they have significant improvement on every aspect of the KAB about marine protection and conservation after joining the programme (Table 10.2), except one candidate who perceived no attitudinal change. Four out of seven members agreed that their knowledge foundation has been consolidated due to the authentic experience gained from the underwater world. Much more knowledge, in particular those regarding technical details, was acquired due to the operational need of diving. The diverse information source of the programme, such as the seminar of Reef Check and the lectures on theory of scuba diving, provided them opportunities to learn knowledge from different perspectives and multiple disciplines (such as knowledge on physics). The diverse knowledge acquired was applied in Phase 2.

Table 10.2 Perceived changes of team members on knowledge, skill, attitude and behaviour after completing the “Courier MS EdU” education programme

Perceived changes on	Number of candidates suggesting a positive change (%)	Summary of changes/gains
Knowledge	7 (100%)	<ul style="list-style-type: none"> • Scientific knowledge about scuba diving and marine sciences, e.g. air and water pressures, formation of thermocline in the water column • Knowledge on environmental sustainability, such as cause and impact of the ghost nets, the coral bleaching, the coral reef destruction and the marine plastic pollution • Local geographical knowledge, including locations of various diving sites in Hong Kong • Basic knowledge on marine species identification, such as on fish and sea urchin species
Skill	7 (100%)	<ul style="list-style-type: none"> • Skill in conducting underwater ecological survey • Skill in marine species identification • Scuba diving techniques • Skill for conducting speech to the public
Attitude	6 (85.71%)	<ul style="list-style-type: none"> • Cherishing marine resource, protecting and conserving marine lives especially those endangered ones • Arousing the interest to learn more about marine lives • Realizing the difference in encountering the marine lives between real marine world and aquarium or TV documentary • Situating underwater, human is equal to any marine organisms. Human being is, in fact, not a superior animal • Human being is so tiny in the sea or even in the universe • Being considerate (attributed to the caring to the diving buddy) • Obtaining sense of achievement when overcoming the challenge of the scuba diving • Awareness of diving safety, extrapolating the awareness to other daily safety issues • Acquiring positive learning attitude though diving (due to the operational need)

(continued)

Table 10.2 (continued)

Perceived changes on	Number of candidates suggesting a positive change (%)	Summary of changes/gains
Behaviour	7 (100%)	<ul style="list-style-type: none"> • Not using sunscreen or detergent during commencing water sport • Not fishing • Not eating shark fin • Using less plastic bag • Reminding others not to disturb marine lives • Spreading the information of marine environment as well as the issues of the marine conservation and protection to other friends • Paying attention to marine-related/environment-related news • Inviting other friends to learn scuba diving and form group to dive • Taking care of others (attributed to the caring to the diving buddy) • Acquiring a new hobby of scuba diving

The pro-environmental or environment-related changes were bolded

Specifically, as hypothesized, the knowledge and skill of scuba diving, the KAB on the marine environmental conservation and protection of the students have been promoted (Table 10.2). It is worth noting that other generic attributes of the members, such as being considerate, obtaining sense of achievement, acquiring the positive learning attitude, were also enhanced after completed the programme.

10.3.3 Visitor Codes and Action Competence

Compared to the self-reported data, the test on the action competence would be more objective. The results of the visitor codes indicated a strong action competence of the team members towards PEB. Most of the team members noted that they would follow almost all the visitor codes without reservation (15.86 out of 17 codes). One member thought that she would attempt to follow M4 and M9 (Table 10.1); however, she was not certain whether she could do it due to the poor buoyancy control during diving. One member provided condition for obeying M3 (Table 10.1) that he would fish outside the marine protected area for food. Another member denied following M7 (Table 10.1), since he would use sunscreen to avoid sunburn during water sport. He further supplemented that he would purchase sunscreen that would cause less harmful effect to the marine environment. These reflections upon one's ability to execute a code in reality are actually illustrative to

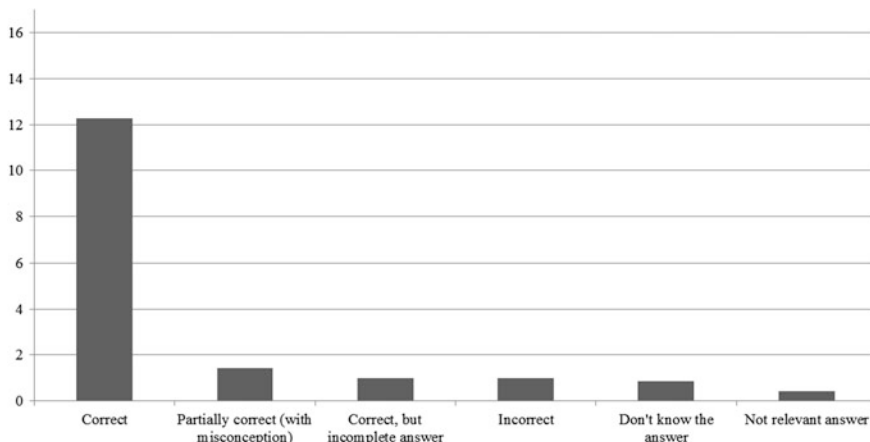


Fig. 10.3 The average number of items (codes of conducts for the marine park visitors) that were explained by all the team members in different correctness

the fact that observance rate of the codes is indeed a good measure of action competence.

On the theoretical background of the codes underneath, an average of 12.29 (± 2.75) out of 17 codes was explained correctly by the team members (Fig. 10.3). Misconceptions about the codes of conduct were identified. On average, one incorrect answer was recorded per member (Fig. 10.3). One misconception that a member has given in the incorrect answer is that he failed to point out—directly the damage of corals as a source of the harm to the fish in “No anchoring area”. This knowledge, however, was well discussed during the training workshop of Phase 1. Another member made a major misconception that only fish in small size should be fished so as to protect the fisheries resource inside the marine protected area. One member also claimed that the marine organisms would escape from the polluted water. This claim was, perhaps, not supported by any scientific evidences.

Most of the results of this objective action competence test demonstrated that the specific learning outcomes of the programmes have largely been achieved. The correct explanation of some codes, such as M9, M10 and D2, indicated that the team members understand the consequences of their diving behaviour in harming the marine environment whereas the correctly explained codes such as M1, M2 and M6 implied an understanding of the ecosystem function of coral reef in providing habitat and food to the marine lives. In particular for codes M8 “Respect our marine environment”, two members highlighted that the anthropogenic adverse effect on the ocean could be irreversible, and the other two members pointed out that mankind should not be just selfish and should have the responsibility to conserve the marine environment.

10.3.4 Effectiveness of Field-Based and Service-Based Learning

Most of the team members emphasized the role of scuba diving played on their change of KAB. While two members suggested having equal knowledge gain if they were participating in a conventional programme without the scuba diving activities of similar nature; four members agreed that the experience in scuba diving did assist in substantiating their understandings on the knowledge content through memory refreshment. One of the four further pointed out that the diving activities provided him a chance to learn from the mistakes made in the field practical.

Almost all members agreed that the diving experience could create visual impact to them which affected their pro-environmental attitude and behaviour. Three of them emphasized the direct observation (evidence) on the consequences of human impacts to the environment. For instance, underwater debris and living organisms trapped in ghost nets. They did self-reflections as well, on how their daily action could degrade the marine ecosystem in a similar manner. The only candidate, who is a part-time water sport instructor claiming to have no attitudinal change after taking the programme, admitted that diving experience enriched his environmental knowledge and he could deliver to his students practicing various water sports in the future.

There were mainly two major comments about the community service component of the programme. Firstly, a general learning initiative was enhanced among participants due to the need for a strong academic background to conduct authentic duties such as the Reef Check. Secondly, the students felt that they contributed to the community through the programme and their efforts were meaningful.

10.3.5 Difficulties Faced by the Team Members

The most common problem that participants came across is the mastering of scuba diving techniques. Three members found it difficult to control their buoyancy underwater, and they wished to have more chances for practices. Two members complained that they need to memorize too much information in a very tight and intensive training period (Phase 1 lasted for less than two months), especially for those who do not have an academic background on environment-related subjects. One member, in particular, pointed out the difficulties in picking up the skills of the marine species identification. One participant also expressed his concern on conducting speech in front of the public, as he thought that it would be a big challenge to him. This demonstrates that the programme had in fact trained the student some soft skills unintendedly.

10.4 Discussion

10.4.1 *Action Competence of the Students*

As stated by the diving team members, the unconventional experience of scuba diving had significant impact on them, altering their pro-environmental attitude and behaviour. One may have query on whether our programme genuinely raised their action competence, since most of the data collected were self-reported and the conclusion was not supported by a longitudinal observation. Indeed, some of the participants did not provide correct explanations on all the codes of conducts and there were misconceptions as well. However, the detail codes of conducts were not explained to the participants in the training sections. The ability of the participants to provide correct explanations on the codes is illustrative of knowledge assimilation, integration and application. The results of action competence test also suggested the accomplishment of specific learning outcomes of the programme. In addition, Jensen and Schnack (1997) have categorized two types of environmental actions, namely direct action addressing problem directly and indirect action engaging others to solve the problem. Without any guidance and encouragement in the training session to spread the pro-environmental message, the members have indeed been involved in indirect actions, such as reminding others not to disturb marine lives, spreading the information of the marine conservation and protection to other friends and inviting other friends to learn scuba diving (Table 10.2). All these findings suggested that the team members have critically thought about the environmental knowledge and theories that they have acquired in the training, integrated the experience gained in the field practical and applied it holistically in their daily lives.

10.4.2 *Scuba Diving as a Tool for Field-Based Learning*

Scuba diving is an effective tool for experiential learning and field-based learning. The visual impacts from scuba diving emphasized by various team members constitute an important part of their experience, which have probably altered their pro-environmental attitude. As suggested by one participant, he can learn from mistake during the actual practice in scuba diving, indicating that he made self-reflections and may have potentially adopted the learning model of Kolb (1984). The articulation of the diving experience with the diving and ecological knowledge in most of the member reflects that diving experience indeed would facilitate the cognitive learning outcome of the learner.

The findings of this study echoed well with similar studies adopting a field-based approach. For example, the interest of pupils on scientific subject was boosted up after their participation in a 5-day lasting field trips at a field centre in Slovakia (Zoldosova & Prokop, 2006). Easton and Gilburn (2012) observed a significant

improvement in cognitive learning of the final-year biology undergraduates after attending a 10-day residential field course in Portugal. Similar to the present study, they also identified secondary learning outcome from the students, which is the strengthening of the integrative learning ability across academic disciplines of the undergraduate due to the intensive and holistic training of the field course. The authentic experience gained by the undergraduates in campus wetlands of Mahidol University, Thailand, altered the attitude of the students, enabling them to value the importance of wetlands and how the wetlands are related to their own livelihoods (Sukhontapatipak & Srikosamatara, 2012).

One of the explanations on why field-based education is so effective is its positive influence on the affective, on top of the cognitive domain of the learner. Affection is found to exert a longer-lasting effect on knowledge acquisition (Easton & Gilburn, 2012). Pupils were able to recall their memory on the animals encountered during an informal fieldwork five months ago (Scott & Boyd, 2014). A large portion (96%) of 128 candidates, ranging from fourth-grade, eighth-grade pupils and adults, could recall the field trips that they have attended during their early schooling years (Dierking & Falk, 1997).

Orion and Hofstein (1994) listed out various factors that affect the quality of learning through field-based education. Direct contact to the physical environment is suggested to be one of the most significant. In addition, Li and Chen (2015) revealed that the natural experience is one of the most significant experiences to the formulation of environmental action in Chinese students. Compared to other field experience, we argued that the adventure nature of scuba diving will augment this affective effect on the learning process of the students.

10.4.3 Scuba Diving for the Service Education

Knowledge, compassion (ethics), and action are the three reciprocally influential factors of the service learning model (Al Barwani et al., 2013). The “Courier MS EdU” programme has included all these three crucial factors: the knowledge and ethics about the Reef Check and seabed cleanup activities were explained in detail both in the training workshop in Phase 1 or in the seminar conducted by the Reef Check 2015; the diving activities of the programme, which was regarded as the most attractive part of the programme by the members, are the action taken. Other than the Reef Check and seabed cleanup, the team members referred the knowledge transfer activities in local schools as a kind of community services. Majority of the team expressed that the activities of community services are very meaningful which triggered them to further study on the environment. The service component of the programme, obviously, has strengthened the members’ learning initiatives that have in turn enhanced the cognitive learning outcome. This finding is concurred with the other EE programmes that involve pupils in protecting sea-turtle poaching in Mexico (Schneller, 2008), and establishing tree nurseries or planting for prevention of soil erosion in Tanzania (Johnson-Pynn & Johnson, 2005).

10.4.4 Limitation and Difficulties in Implementing the Programme

Employing scuba diving for the field-based education strategy is quite different from the other terrestrial-based learning activities. Based on the experience in organizing the “Courier MS EdU” programme, we summarized some limitations and difficulties that educator would probably come across when adopting scuba diving as the tool of field-based education. They are namely the resource implication, the risk of diving and the deviation of the expected learning outcome.

As stated by Lonergan and Andresen (1988), field trips are labour- and capital-intensive activities compared to the normal classroom-oriented teaching and learning. The involvement of scuba diving has escalated the resource demands of the programme. The major expenditures associate with scuba diving includes the transportation fee of both land transport and the vessel charter, the instalment fee (or rental charge) of diving gears, the fee for insurance coverage (depends on the legal requirement of the country) and the arrangement of the storage space for the gears. They costed ~USD\$1,300 per member in the programme. These financial and logistic requirements are generally not a favourable attraction and even create hurdles, to most educators with limited resources. Institutions with relatively easy access to seashore and those conducting regular underwater researches have apparent advantages. Choosing a relatively accessible field site and substituting scuba diving by snorkelling could be the means to reduce expenses. Along with the trend of the cost reduction in purchasing diving-related equipment, we believe that the budge and resource in which the educators need to throw is reasonably low and manageable from the perspectives of the departmental capacity or individual funding support.

Scuba diving is regarded as a “risky” activity in the community. In fact, it is a well-developed sport. The nowadays views on scuba diving have employed the concept of risk assessment and management (Wilks & Davis, 2000). Provided that the diver strictly obeys all the rules and guidelines, the chance of accident will be minimal. The repeated emphasis on the safety awareness by the participants shown in the data set (Table 10.2) demonstrated that they were successfully equipped with the concept of safety. Nevertheless, safety is the prime concern of the whole project. To manage the risks of having accident, all the students were requested to complete a standard diving training before they were allowed to conduct any underwater survey. Basic body check-up and a swimming test were included in the diving training, in order to assure the suitability of the students for diving. The underwater surveys were conducted in coral community located in the shallow water (<8 m). Under the supervision of the lecturer (certified diving master), no dangerous action or action beyond the students’ certified qualification was allowed. Emergency protocol, first aider and tender boat were all provided in the field practical. With the caution of the potential risk and a good self-discipline, scuba diving would be a safe and cost-effective field-based activity.

With regard to learning outcome, the adventure nature of scuba diving may lead to a leisurely expectation of the students, which may diminish the cognitive outcome of a field-based activity (Orion & Hofstein, 1994). Students tend to enjoy the “leisure” trip and ignore the learning objectives, especially on the cognitive aspects. While a focused knowledge foundation was demonstrated to promote the positive PEB (Ajzen, 1991), the marine-based knowledge of the scuba divers, in particular, correlated well with the PEB during diving (Thapa et al., 2005). Thus, the current programme focused on the theoretical construction of the team members on the marine protection and conservation issues during the training period. We carried out briefing and debriefing in every field practical, which was shown to be of significant importance to knowledge consolidation of a programme (Lonergan & Andresen, 1988).

10.4.5 SoLT and the Programme

While the conventional scope of SoLT mainly focused on the setting of a formal classroom, the current study adopting field-based approach in enhancing students’ learning experience in environmental education undoubtedly broadened the conceptualization of learning in SoLT. As shown in the interview data, the first-hand underwater experience of the members, especially the visual impact in the marine environment, indeed strengthened students’ initiative to enthusiastically learn and critically think about marine conservation. It is obvious that an embracement of more diverse learning experience of the students would widen the scope of SoLT and further facilitate the learning of students.

The role of the institution to recognize and support practice of SoLT is also important. As illustrated in the difficulties of implementing the education programme, the support in any forms from the institution, for example, the financial and logistic supports, is crucial. Furthermore, the institution could facilitate the sharing of good practice of SoLT within, or even outside, the institution, by creating the atmosphere for SoLT. The detail of the current programme was introduced and discussed with colleagues in an in-house knowledge transfer seminar. The seminar, which was organized by the institution, has provided a platform for the exchange of SoLT experience and practice among colleagues, which would definitely contribute to the continual improvement of learning and teaching of the programme.

10.5 Conclusion

As shown in the current study, the scuba diving in association with relevant training on marine conservation is an effective teaching intervention for environmental education. By creating visual impact and first-hand experience, the participants reported changes in knowledge, skill and attitude towards marine conservation. The

awareness of participants on the need of protecting and conserving our marine ecosystem and, thus, their action competence towards a sustainable world, were strengthened.

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Chapter 11

Developing Undergraduates’ Self-management and Self-awareness Abilities Through Service-Learning

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Abstract This chapter contributes to knowledge about the relationship between service-learning and undergraduates’ personal development, particularly in the areas of self-management and self-awareness. Students who enrolled in cocurricular learning courses in 2014–2015 at the Education University of Hong Kong were invited to participate in the study. Pre- and post-test surveys were administered to track participants’ development of self-management ability and self-awareness during the course of a semester. It was found that cocurricular activities adopted in the courses, regardless of service or non-service-learning in nature, have helped to improve undergraduates’ self-management abilities. However, students’ self-awareness abilities remained unchanged. Influential elements, namely meaningful experience, reflection, diversity, youth voice, and link to curriculum, were reported to have moderate or marginal correlations with self-management and self-awareness. Possible reasons and implications on the cocurricular course development were elaborated and discussed.

Keywords Service-learning · Cocurricular activities · Self-awareness · Self-management · Undergraduate

11.1 Introduction

The current chapter addresses the possibility of integration between formal classroom learning and outside classroom experience by reporting an empirical study on service-learning and its effects on student development, namely self-management and self-awareness. Service-learning is “a form of experiential education in which

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students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development” (Jacoby, 1996, p. 5). Different from formal classroom learning, service-learning engages students in service-based activities and intentionally connects service experience with desirable learning objectives in the areas of academic, civic, and personal development (Jacoby, 1996).

Service-learning emerged in the 1960s in North America (Stanton, Giles, Jr. & Cruz, 1999). It has since been extensively accepted as a pedagogy (Bryant, Schönemann, & Karpa, 2011; Kaye, 2010) or a program in curricular or cocurricular in higher education (Jacoby, 2015) across different educational regions, such as Australia (Zimbardi & Myatt, 2014), Great Britain (Deeley, 2015), Japan (Sato, McCarthy, Murakami, Nishio, & Yamamoto, 2010), Taiwan (Lin, Wu, Wu, Pan, & Liao, 2014), and Singapore (Lee, 2010), to promote student active learning in various domains. Although service-learning has been promoted and is rapidly developing in higher education institutions in East Asia, empirical examination of the impacts and effective practice of service-learning with reference to the local context has not been accumulated. Such investigation is timely and important in order to provide cogent evidence of effective service experience for students. The present study was conducted at the Education University of Hong Kong. Here, both extracurricular service programs and credit-bearing service-learning courses are being developed across departments. Further, recently, compulsory cocurricular and service-learning courses have been implemented to further enhance student learning experience by exposing students to service-based activities.

11.2 Research Context

Much research has reported that service-learning may promote undergraduates’ personal growth in the areas of developing self-knowledge (Eyler & Giles, 1999), responding to others as co-beings (Vandenberg, 1991), yielding a new set of lenses for seeing the world (Eyler & Giles, 1999), enhancing meaning-making and openness to different types of people and experiences (Bringle & Hatcher, 1999; Jones & Abes, 2004), improving communication skills (Katz, DuBois, & Wigderson, 2014), dispelling negative stereotypes (Buch & Harden, 2011), etc. Although there is an extensive empirical research being conducted in the Western context, it is not yet known whether the conclusions drawn from these studies can be generalized to other parts of the world. Therefore, this study intends to fill the gap and provide definite evidences to show which elements in service-learning contribute to successful implementation of specific programs and particular course settings.

11.2.1 Co-curricular and Service-Learning Course in EdUHK

The current study was situated at the Education University of Hong Kong (EdUHK), formerly known as the Hong Kong Institute of Education (HKIEd), which is a publicly funded tertiary institution offering teacher education programs as well as complementary social sciences and humanities programs. From 2012–2013, as part of the total learning experience of the new curriculum at EdUHK, all undergraduates were required to complete a cocurricular learning (CoC) course. The cocurricular course aimed to broaden students' learning experience and enhance their generic skills. A CoC course consisted of 6–9 h of lectures, 32–40 h of outside classroom practice, and 6–9 h of reflection activities. Diverse outside classroom activities were organized by course lecturers in a range of activities relevant to the courses such as visiting museums, doing sports, and engaging in service-based activities.

The curriculum structure of CoC was implemented for a relatively short period of time at EdUHK from 2012 to 2013. It was then replaced by CSL with the addition of a compulsory service-learning activity. In order to further enhance undergraduates' core competences in terms of positive personality, positive work attitude, cooperation and teamwork, and interpersonal skills and enabling students to “achieve learning by reflecting on how they construct meaning out of their experiences” (HKIEd, 2014, p. 3), students of EdUHK are required to complete a 3-credit cocurricular and service-learning (CSL) course. This requirement has been in place since 2014–2015, where all students are involved in service-based activities (HKIEd, 2014). Indeed, the CSL course has adopted a similar course structure to the CoC course.

The difference in curriculum structure between the CoC and CSL courses is the addition of a compulsory service-learning element in the CSL course. This dissimilarity is expected to constitute differential contexts for student learning. This will enable us to know more about the impacts of challenges and difficulties of the implementation of CoC and CSL courses. Given that CSL courses have a similar structure to CoC courses, the study on the impacts of CoC and CSL courses is timely and important for constructing service-learning courses.

11.2.2 Self-management and Service-Learning

In higher education, self-management is one of the most important competences for emerging adults to develop. Self-management is defined as the process of actively applying “a set of cognitive and behavioral strategies to guide their goal-directed activities over time and across changing environments” (Xue & Sun, 2011, p. 142). Cocurricular experience and service-based activities may provide students with opportunities to generate ideas on planning an activity, participating in organizing

and implementing activities, and evaluating the outcomes and impacts of activities. This process of engagement may trigger a clear sense of goals and encourage students to better manage personal time and different types of tasks, which may in turn improve and enhance individuals' ability to increase self-discipline and take on responsibility (Yang et al., 2014).

11.2.3 Self-awareness and Service-Learning

Self-awareness, defined as situational self-focus, has both public and private dimensions. Public self-awareness is "characterized by attentiveness to those features of one's self that are presented to others." On the other hand, private self-awareness "involves attentiveness to the internal, personal aspects of one's self such as memories and feelings of physical pleasure or pain" (Govern & Marsch, 2001). Researchers in service-learning have proposed that faculties may include self-awareness as one of the learning objectives in their service-learning programs and courses (Lagana & Rubin, 2002). The reason is that interaction with people from different backgrounds would enable students to "defend their points of view as well as to engage with others' perspectives in ways that promote both greater self-awareness and questioning of their own values and beliefs" (Jacoby, 2015, p. 234). Empirical research has reported that service-learning can help students gain a deep sense of self-awareness from diverse professional backgrounds such as nurses (Corrigan & Kwasky, 2014) and preservice teachers (Almazroui, 2010; Byrne, 2009). In addition, by developing personal autonomy through real-world experiences, students' recognition of and faith in their potential can increase (Ngai, 2006).

Previous empirical research has reported the effectiveness of service-learning on undergraduates in different learning domains. However, more specific knowledge such as the relationship between service-learning program elements and student learning outcomes is not known. Given that service-learning has been broadly accepted in higher education across countries and regions, there is a pressing need to see what and how elements and mechanism in service-learning can facilitate students to achieve the desired learning outcomes. The present study intends to address the issue by investigating the implementation of the CoC course in EdUHK with a focus on student outcomes in self-management and self-awareness.

11.3 The Present Study

The present study proposes to answer two questions:

- To what extent do undergraduates develop their self-management competencies and self-awareness in credit-bearing cocurricular learning courses?
- What elements in service-learning courses affect undergraduates' development in self-management and self-awareness?

To address these questions, both quantitative and qualitative methods were employed in the study to identify students' learning outcomes in self-management and self-awareness, as well as to understand the influential elements in service-learning. Three cocurricular courses without service components and three cocurricular courses with service-learning design (i.e., 30–40 h of service-based activities) were selected for the study. A pretest of student participants' self-management competence and self-awareness was conducted in the second or third week of the semester, and a post-test of participants' self-management and self-awareness with the addition of participants' evaluation of service-learning elements was administered at the final session of each course. A total of 111 students completed the pre- and post-test questionnaires. Interviews were arranged for students, course lecturers, and practicum supervisors (agency staff of partnership communities) at the end of the courses, and interview questions focused on student learning outcomes and influential service-learning elements. This paper is part of a major study and contributes to the report of the quantitative findings about students' learning outcomes in self-management and self-awareness.

11.3.1 Measures

Situational Self-Awareness Scale (SSAS). The scale was developed by Brenner (2003) to assess participants' level of self-awareness. Three subscales were defined as private self-awareness, public self-awareness, and awareness of immediate surroundings. The scale included a total of 6 items against a 7-point Likert scale, ranging from strongly disagree to strongly agree. Sample items were as follows: "I try to complete tasks on time"; "I make schedules to help myself complete tasks on time"; and "I get all the help I can to help me reach my goals." It yielded good reliability with a range of Cronbach's alphas of 0.73–0.78 across the three subscales for the current study.

The Self-Management Scale. The scale was developed by Xue and Sun (2011) to assess undergraduate students' self-management abilities in daily life. The original scale included 21 self-reported items designed to evaluate participants' relationship management and self-management. Out of the 21 items, 11 items were used to measure participants' self-management with a focus on time and goal management by using a 5-point Likert scale, ranging from totally disagree to totally agree. The coefficient alpha of the scale in the current study was 0.81. Sample items for public self-awareness were as follows: "I am self-conscious about the way I look" and "I am concerned about what other people think of me." Sample items regarding private self-awareness were as follows: "I am reflective about my life" and "I am aware of my innermost thoughts." Sample items relating to the awareness of surroundings were as follows: "I am keenly aware of everything in my environment" and "I am conscious of what is going on around me."

Cocurricular and Service-learning Program Elements. A 21-item scale was employed to assess the quality of the six cocurricular courses. The constructs were

adapted from the K-12 Service-Learning Standards for Quality Practice (*SLQP*) proposed by the National Youth Council in 2008 (Billig, 2009). The *SLQP* consists of 33 items to assess eight subscales being that of meaningful service, link to curriculum, diversity, reflection, youth voice, duration and intensity, progress monitoring, and partnership. The *SLQP* adopts a 4-point Likert scale with a response scale ranging from 1 (strongly disagree) to 4 (strongly agree). Five subscales which the current study tested included link to curriculum, meaningful experience, youth voice, diversity, and reflection, with the number of items being 4, 5, 5, 4, and 5, respectively. The wordings were adjusted to make it applicable to both service-based activities and other forms of cocurricular practices. Sample items were as follows: “the service-learning/co-curricular course provided me with interesting and engaging activities/experiences” (*meaningful experience*); “the service-learning/co-curricular experience was aligned with the academic and/or programmatic curriculum” (*link to curriculum*); “the reflection allowed me to think deeply about complex community problems and alternative solutions” (*reflection*); “the service-learning/co-curricular experience helped me to actively seek to understand and value the diverse backgrounds and perspectives of those offering and receiving service” (*diversity*); and “I was involved in the decision-making process throughout the service-learning/co-curricular experience” (*youth voice*).

11.3.2 Data Analysis

Mixed between- and within-subject ANOVA was used to analyze the change in students’ self-management and self-awareness abilities after taking a CoC course over a semester. Analysis of the pre-test and post-test scores of the service-based and non-service-based CoC courses were conducted to investigate the differences in students’ personal growth between taking service-based and non-service-based courses. Paired samples were used to investigate the degree of pre- and post-test changes for service courses and non-service courses independently regarding those that were found to be significant in their respective ANOVA study.

11.4 Findings

The reliability of the scales was investigated by the use of Cronbach’s alpha. Relationship management (0.836), self-management (0.820), self-awareness (0.884), and social awareness (0.934) all yielded good alpha values.

Self-management. A mixed factorial ANOVA was used to analyze the change in students’ self-management after taking a CoC course over a semester. Results revealed that there were no significant interactions found between the type of courses and testing, Wilks’ lambda = 0.983, $F(1, 100) = 1.771$, $p > 0.19$. There was a significant main effect for the testing factor (pretest, post-test), Wilks’

Table 11.1 Self-management in service and non-service-based CoC courses

		Paired differences					T	Df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
					Lower	Upper			
SL	PreSM— PostSM	-0.11	0.33	0.04	-0.20	-0.03	-2.716	62	0.009**
Non-SL	PreSM— PostSM	-0.20	0.31	0.05	-0.30	-0.099	-3.995	38	0.000**

**Paired-samples test is significant at the 0.01 level; *Paired-samples t test is significant at the 0.05 level

lambda = 0.816, $F(1, 100) = 22.581$, $p = 0.000$, partial eta-squared = 0.18. Both groups of students obtained a higher score in the post-test round than that of the pretest round. The main effect comparing the two types of courses was not significant, $F(1, 100) = 1.88$, $p < 0.17$, partial eta-squared = 0.02, suggesting no difference in self-management scores between service and non-service courses.

A paired-samples t test was conducted to compare the self-management score of the students who took service courses in pretest and post-test conditions. There was a significant difference in the scores for pretest ($M = 3.6$, $SD = 0.327$) and post-test ($M = 3.7$, $SD = 0.326$) conditions, $t(62) = -2.72$, $p > 0.009$. These results suggest that the students' self-management ability increases after taking a course implementing service-learning (Table 11.1).

Another paired-samples t test was conducted to compare the self-management score of the students who took non-service courses in pretest and post-test conditions. There was a significant difference in the scores for pretest ($M = 3.5$, $SD = 0.438$) and post-test ($M = 3.7$, $SD = 0.355$) conditions, $t(38) = -3.99$, $p = 0.000$. These results suggest that students' self-management abilities also increased after taking a course without the use of service-learning (Table 11.1).

Self-awareness. A mixed between- and within-subjects ANOVA was conducted to compare scores on self-awareness between service and non-service courses across two testing periods (pretest and post-test). There was no significant interaction between the type of courses and testing, Wilks' lambda = 0.99, $F(1, 101) = 0.277$, $p > 0.64$. There was no significant main effect for the testing factor, Wilks' lambda = 1.00, $F(1, 101) = 0.006$, $p > 0.94$, partial eta-squared = 0.000. Both groups of students showed no changes in their self-awareness scores in the post-test stage. The main effect comparing the two groups of courses was also not significant, $F(1, 101) = 0.876$, $p < 0.352$, partial eta-squared = 0.009, suggesting no difference in self-awareness scores between service and non-service courses.

Self-awareness (Surroundings). A mixed between- and within-subject ANOVA was conducted to compare scores on self-awareness (surroundings) between service and non-service courses across two testing periods (pretest and post-test). There was no significant interaction between the type of courses and testing, Wilks'

$\lambda = 0.99$, $F(1, 105) = 0.143$, $p > 0.706$. There was no significant effect for the testing factor, Wilks' $\lambda = 0.99$, $F(1, 105) = 0.656$, $p > 0.420$, partial eta-squared = 0.006, with both groups of students showing no changes in their self-awareness (surroundings) scores in the post-test stage. The main effect comparing the two groups of courses was also not significant, $F(1, 105) = 1.334$, $p < 0.251$, partial eta-squared = 0.013, suggesting no difference in self-awareness (surroundings) scores between service and non-service courses (see Table 11.2).

Self-awareness (Private). A mixed between- and within-subject ANOVA was conducted to compare scores on self-awareness (private) between service and non-service courses across two testing periods (pretest and post-test). There was no significant interaction between the type of courses and testing, Wilks' $\lambda = 0.999$, $F(1, 105) = 0.080$, $p > 0.778$. There was no significant main effect for the testing factor, Wilks' $\lambda = 0.996$, $F(1, 105) = 0.473$, $p > 0.493$, partial eta-squared = 0.004, with both groups of students showing no changes in their self-awareness (private) scores in the post-test stage. The main effect comparing the two groups of courses was also not significant, $F(1, 105) = 0.158$, $p < 0.692$, partial eta-squared = 0.002, suggesting no difference in self-awareness (private) scores between service and non-service courses (see Table 11.2).

Self-awareness (Public). A mixed between- and within-subject ANOVA was conducted to compare scores on self-awareness (public) between service and non-service courses across two testing periods (pretest and post-test). There was no significant interaction between the type of courses and testing, Wilks' $\lambda = 0.996$, $F(1, 103) = 0.418$, $p > 0.519$. There was no significant main effect for the testing factor, Wilks' $\lambda = 0.999$, $F(1, 103) = 0.124$, $p > 0.726$, partial eta-squared = 0.001, with both groups of students showing no changes in their self-awareness (public) scores in the post-test stage. The main effect comparing the two groups of courses was also not significant, $F(1, 103) = 0.159$, $p < 0.691$, partial eta-squared = 0.002, suggesting no difference in self-awareness (public) scores between service and non-service courses (see Table 11.2).

Relationship between Self-management, Self-awareness, and Service-learning Elements. Of the five program elements that were examined, only the element of *diversity* was marginally correlated with participants' self-management ability at the 0.01 level ($r = 0.283$) (see Table 11.3).

For the association between service-learning elements and participants' self-awareness development, it was found that all the five elements—*meaningful experience, link to curriculum, diversity, reflection, and youth voice*—were positively correlated with the three domains of self-awareness: *public self-awareness, private self-awareness, and surrounding self-awareness*. In this, *link to curriculum* showed a marginal correlation with self-awareness, whereas all the other four elements reported moderate correlation with the three domains of self-awareness (see Table 11.4).

Table 11.2 Self-awareness in service- and non-service-based CoC courses

		Paired differences					T	Df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
					Lower	Upper			
SL	PreSA— PostSA	-0.04	0.97	0.12	-0.28	0.20	-0.30	63	0.765
	PreSA(s)— PostSA(s)	-0.12	1.05	0.13	-0.37	0.14	-0.92	67	0.359
	PreSA(pi)— PostSA(pi)	0.039	1.07	0.13	-0.22	0.30	0.30	67	0.764
Non-SL	PreSA(pb)— PostSA(pb)	-0.03	1.01	0.12	-0.28	0.22	-0.24	65	0.808
	PreSA— PostSA	0.05	.78	0.13	-0.20	0.31	0.41	38	0.685
	PreSA(s)— PostSA(s)	-0.04	.86	0.14	-0.32	0.24	-0.31	38	0.758
	PreSA(pi)— PostSA(pi)	0.09	.73	0.12	-0.14	0.33	0.80	38	0.428
	PreSA(pb)— PostSA(pb)	0.10	1.03	0.16	-0.23	0.44	0.62	38	0.537

**Paired-samples t test is significant at the 0.01 level; *Paired-samples t test is significant at the 0.05 level

Table 11.3 Correlations of self-management and service-learning elements

		SM	SL	MS	LiC	R	D	YV
SgfgM	Pearson's correlation							
	Sig. (2-tailed)							
	N	106						
SL	Pearson's correlation	0.258**						
	Sig. (2-tailed)	0.009						
	N	101	105					
MS	Pearson's correlation	0.177	0.727**					
	Sig. (2-tailed)	0.070	0.000					
	N	105	105	109				
LiC	Pearson's correlation	0.171	0.765**	0.612**				
	Sig. (2-tailed)	0.082	0.000	0.000				
	N	104	105	108	109			
R	Pearson's correlation	0.187	0.848**	0.504**	0.488**			
	Sig. (2-tailed)	0.058	0.000	0.000	0.000			
	N	103	105	107	107	108		
D	Pearson's correlation	0.155	0.866**	0.455**	0.534**	0.770**		
	Sig. (2-tailed)	0.117	0.000	0.000	0.000	0.000		
	N	103	105	107	107	108	108	
YV	Pearson's correlation	0.283**	0.845**	0.492**	0.520**	0.637**	0.694**	
	Sig. (2-tailed)	0.004	0.000	0.000	0.000	0.000	0.000	
	N	103	105	107	107	107	107	108

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Table 11.4 Correlations between self-awareness and service-learning elements

SA	Pearson's correlation	SA	SAs	SApi	SApb	SL	MS	LtC	R	D	YV
	1										
	108										
	0.948**	1									
	0.000										
	108	110									
	0.933**	0.839**	1								
	0.000	0.000									
	108	109	109								
	0.925**	0.827**	0.769**	1							
	0.000	0.000	0.000								
	108	109	108	109							
	0.587**	0.543**	0.574**	0.533**	1						
	0.000	0.000	0.000	0.000							
	103	105	104	104	105						
	0.427**	0.435**	0.370**	0.399**	0.727**	1					
	0.000	0.000	0.000	0.000	0.000						
	107	109	108	108	105	109					
	0.243*	0.233*	0.263**	0.193*	0.765**	0.612**	1				
	0.012	0.015	0.006	0.045	0.000	0.000					
	107	109	108	108	105	108					
	0.586**	0.524**	0.580**	0.539**	0.848**	0.504**	0.488**	1			
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
	106	108	107	107	107	105	107	107	108		

(continued)

Table 11.4 (continued)

	SA	SAs	SApi	SApb	SL	MS	LtC	R	D	YV
D	Pearson's correlation	0.532**	0.489**	0.546**	0.866**	0.455**	0.534**	0.770**	1	
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
	N	106	108	107	105	107	107	108	108	
YV	Pearson's correlation	0.537**	0.492**	0.517**	0.845**	0.492**	0.520**	0.637**	0.694**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	N	106	108	107	105	107	107	107	107	108

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

11.5 Discussion

The present study sets out to investigate the extent to which service-learning impacts upon undergraduates' personal development in the areas of self-management and self-awareness. The results from the pre- and post-tests showed that over a period of one semester, students' self-management abilities significantly improved whether they were exposed to service-based or non-service-based cocurricular practices. Regarding self-awareness, students reported that their self-awareness remained unchanged after the course. This finding is inconsistent with the literature that reported positive and explicit impacts of service-learning upon individuals' self-awareness development (Almazroui, 2010; Byrne, 2009; Corrigan & Kwasky, 2014; Ngai, 2006). The relationship between self-management, self-awareness, and the five program elements were examined. Three findings were found: (1) *Diversity* was marginally related to self-management; (2) four elements—*meaningful experience, reflection, diversity, and youth voice*—were moderately correlated with self-awareness; and (3) *link to curriculum* was marginally interrelated to self-awareness. These findings are further elaborated and explained in the following sections.

11.5.1 *Cocurricular Activities that Promote Self-management Ability*

Defined as “a set of cognitive and behavioral strategies to guide their goal-directed activities over time and across changing environments” (Xue & Sun, 2011, p. 142), self-management competence can be improved when students increasingly make use of multiple strategies to monitor the implementation of an activity over a period of time or use strategies to transfer knowledge and skills from practical settings to academic settings. One possible reason for the development of students' self-management ability is that learning and assessment tasks adopted in the six courses reflected the aforementioned principles of self-management. All six cocurricular courses involved their students in diverse learning tasks and all adopted a group project as one of the assessment tasks. Two types of group projects were reported: issue-based project and activity-based project. Issue-based project provided students with opportunities to develop a statement on one of the social or personal issues, search evidence from diverse sources to test the statement, and make sound inferences based upon solid knowledge. This process involved students in using cognitive strategies such as analysis, synthesis, evaluation, and induction. Activity-based project required students to plan and lead an activity as organizers, which can be the trigger for the development of organizational skills, sense of responsibility, duty distribution, and collaboration.

The second possible explanation is informed by the data. It shows that *diversity* had marginal impacts on the development of students' self-management

competence. Cocurricular practice provided opportunities for students to approach and interact with people from diverse backgrounds, which may subsequently enable students to “identify different points of view to gain understanding of multiple perspectives” (NYLC, 2009). These striking experiences challenged students to think out of their comfort zones, required them to transfer their knowledge and skills across settings, from learning of academic content to practical experience and vice versa. This process can also be regarded as a turning point for students to broaden their spectrum of cognitive strategies. This evidenced that students have learnt to define a problem or an issue from real-life experiences, seek the connected points between academic content and practical knowledge, and use multiple sources of evidences to enhance their learning.

11.5.2 Unchanged Self-awareness

As contended by Goven and Marsch (2001), self-awareness is thought to be transient states “that are susceptible to manipulation” (p. 366). Cocurricular experiential activities provided in the six courses exposed students to diverse situations and environments and supposed that students’ improvement of self-awareness can be observed. However, pre- and post-test results showed that students’ self-awareness in terms of private, public, and surrounding self-awareness maintained unchanged in the student participants, regardless of whether they were from service-based or non-service courses.

There can be several reasons for this result. First, none of the six courses had clearly defined self-awareness as one of the learning objectives of the course. Accordingly, there were no related content, activities, reflections, and assessments arranged to engage students in the process of developing self-awareness. This result informs that exposure to cocurricular experience alone is insufficient to develop students’ self-awareness. Desired learning objectives should be explicitly planned and incorporated in teaching and learning activities purposefully. Second, cocurricular activities consisted of diverse focuses ranging from personal skills to social issues, from knowledge application to moral character, which might distract students to achieve multiple learning outcomes and subsequently reduce the effects of situational learning on self-awareness. Third, although students had to complete at least 32 h of cocurricular activities, there were no definite answers on the effective duration and intensity of activities that might develop individuals’ self-awareness. Further studies may specify the impacts of various elements of service, such as characteristics of service recipients, features of service activities, and duration of service. Both quantitative and qualitative methods may be employed to unravel the “black box” of the service process.

11.5.3 Relationship Between Self-awareness and Service-Learning Elements

Although the current study reported that the development of students' self-awareness over one course period was not significant, all the five program elements, namely meaningful experience, diversity, reflection, youth voice, and link to curriculum, had moderate or marginal positive correlations with students' self-awareness. The more the students sensed and engaged in the elements above, the greater the possibility that their self-awareness reported a higher level of development. Characteristics of the five elements are explained as follows.

First, meaningful experience provided participants with interesting and engaging activities that addressed issues that were personally relevant to the participants (for instance, drama performance) or issues that were society-focused (such as poverty and policy for the elderly) (NYLC, 2008). Personal relevant activities helped students to be conscious of their internal, personal aspects of the self, while society-focused activities may facilitate students to identify themselves as members of society and pay attention to the features of one's self that were presented to others.

Second, lecturers of the six courses engaged students in different types of *reflection* including a variety of verbal, written, and artistic activities that occurred before, during, and after the experience (NYLC, 2008), which allowed students to demonstrate their learning in different domains as well as to express their personal feelings, in particular when cocurricular activities involved students in issues that were value- and emotion-laden. Prompt reflection activities and instant feedback from faculty or activity supervisors proved timely and important to help students consolidate those experiences.

Third, the element of *diversity* encouraged participants to identify and analyze different points of view to gain an understanding of multiple perspectives, through which students develop their interpersonal skills and learn to understand and value diverse backgrounds and perspectives (NYLC, 2008). Interaction with people from diverse social groups is crucial for the improvement of self-awareness because people from different backgrounds can act like a mirror through which students can actively reflect upon their own beliefs, values, and behavior.

Fourth, when students were engaged in generating ideas, decision-making, evaluating during the planning, implementation, and evaluation processes (NYLC, 2008), the sense of autonomy increased as students may be motivated to complete learning tasks with stronger involvement and better performance. The amount of discussion, negotiation, and interaction opportunities between students, peers, and activity participants encouraged students to evaluate self-experience from their own perspectives and from the others' perspectives.

Lastly, regarding link to curriculum, course objectives and scope of content were related to service experience with different degrees. In future, course lecturers may

intentionally provide infrastructure to facilitate students' transfer of knowledge and skills from one setting to another. Given that service-learning activities are normally conducted outside classroom and may not be supervised by course teachers directly, digital technology can be employed to provide a platform that records student experience, facilitates students to exchange ideas among themselves, and provides prompt feedback from course teachers.

11.6 Conclusions and Limitations

The present study reported the findings of a sample of EdUHK students' development of self-management and self-awareness through exposure to cocurricular learning experience. Three conclusions can be drawn from the data and discussion: (1) Cocurricular experiences promoted undergraduates' development of self-management ability when students had engaged in learning tasks that required the use of multiple cognitive and behavioral strategies; (2) self-awareness may not have been developed even as individual students were exposed to diverse situations; and (3) the adoption of quality service elements in terms of *meaningful experience, reflection, diversity, youth voice, and link to curriculum* may facilitate emerging adults' development of self-management and self-awareness.

The limitations of the present study were observed to be its relatively small size of samples, less specification of types of cocurricular activities, and a lack of triangulation from other sources of evidences. Future studies can employ multiple methods to investigate students' self-awareness and examine different types of cocurricular activities.

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Chapter 12

Teaching and Learning of Literary Criticism and Creative Writing

Chi Ming Tam

Abstract Literature education in tertiary institutes generally focus on literary criticism, which includes studying, evaluation, and interpretation of literature while most teachers are familiarized themselves with this approach in teaching. However, in recent years, creativity and skills in writing have become more and more important for students. As a result, courses of creative writing have been developing in tertiary institutes quickly and actively. Literary criticism acquires analytical skills while creative writing needs creativity. The two subjects seem to be in opposite directions. Therefore, teachers who teach literary criticism are not willing to teach creative writing. However, are the two subjects totally different? Or just on the two sides of the same coin? In this article, the author, who is a teacher of both literary criticism and creative writing, is going to analyze the relationships between literary criticism and creative writing and also to provide compromises for learning and teaching the two subjects.

Keywords Literary criticism · Creative writing · Literature education

12.1 Introduction

Literature education in tertiary institutes focuses on teaching literary criticism, which includes the studying, evaluation, and interpretation of literature. This teaching approach is familiar to most Chinese teachers in Hong Kong. However, in recent years, the applications of creativity and skills in writing have become important to Hong Kong students. Creative writing courses have been developing in tertiary institutes rapidly and actively since last few years. For instance, the B.A.

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(Honors) in Creative and Professional Writing was inaugurated in Hong Kong Baptist University from 2012, and The Open University of Hong Kong also offers Bachelor of Arts with Honors in Creative Writing and Film. Most of the undergraduate programs of universities offer creative writing courses, including Lingnan University, The Education University of Hong Kong (EdUHK), and some of creative writing courses are compulsory for B.A. program as well. However, some people may think literary criticism and creative writing are two different aspects in literature education. The former acquires analytical skills, while the latter needs creativity. Hence, most teachers prefer teaching literary criticism to creative writing. In fact, are the two subjects having no similarity? Or is it just a matter of the two sides of the same coin? In this paper, I am going to analyze the similarities and differences between literary criticism and creative writing, as well as to suggest compromising methods of learning and teaching the two subjects.

Among Hong Kong's Chinese teachers, most of them are having a strong ability in teaching either literary criticism or creative writing, but not both. What factors contribute to this phenomenon? Generally, creative writers have aesthetic sensibilities. They observe their surroundings with life experience and in different perspectives from others'. Creative writers use imagination and aesthetic sensibilities to experience and perceive the world which is more beautiful and artistic than the "real world." As we all know, from a theoretical point of view, the talents of creative writers are gifted. Therefore, some Chinese teachers assume that the aesthetic sensibility, life experience, imagination, and other abilities for creative writers cannot be improved through teaching, and the skills for creative writing can only be obtained through studying masterpieces. There is a very famous statement of the traditional Chinese literature theory claiming that "the writing ability and aesthetic sensibility cannot be taught, even from father to son, nor elder brother to younger brother." (by Cao Pi 曹丕 (187–226), 'On Articles' 《典論論文》) In this regard, literary criticism is comparatively important for the learning and teaching of literature in tertiary education.

Literary criticism is a subject on how to discern and evaluate creative writings and masterpieces. It helps students to acquire the knowledge of literature theories, genres, and analytical skills. Most courses from literature programs offered by tertiary institutes emphasize only on literary theories and critical writings. Since creative writing is assumed to be a self-learning subject, schools tend to separate creativity writing courses to an independently area from the conventional training of literature education. In addition, some teachers believe that students can also be good writers if they have adequate knowledge in literature theories. All of these claims can be proved from the course curriculum designed by the department of literature of Hong Kong's institutes. For example, the graduation requirement of B. A. (Language Studies) program of EdUHK is 120 credit points; however, only two courses, creative writing and media writing, are related to writing, and all the rest are linguistics, literary studies, and cultural studies. (see: http://www.i.ed.edu.hk/degree/ba_lang_dse.htm#para03; there

are similar situations among the Language and Literature Departments of institutes/Universities in Hong Kong.)

In my point of view, “criticism” and “creativity” are in a close relationship. No one can determine which of them comes first. Their relationship is as illusory as that of an egg and a hen. It is impossible to know whether an artist or a critic appeared first. So, how do teachers teach creative writing? Can students enhance their creativity through school learning and teaching? What are the purposes of learning literary theories and teaching creative writing? How do students make use of their own creativity to understand more about literary theories and criticism approaches?

12.2 Interview with Students

In this paper, qualitative measures are applied as the research methodology. A total of 40 final-year students of EdUHK were interviewed. The interviews were conducted after the last lesson of Chinese literature in May 2015. During which, they shared experiences in learning literary criticism and creative writing in tertiary institutes, as well as educational backgrounds in developing analytical skills and creativity. Listed below are the interview questions:

- Q1. Have you received trainings of Creative Writing and Literary Criticism in your tertiary education? If yes, please specify.
- Q2. Do you think Creative Writing or Literary Criticism is difficult? Why?
- Q3. Between Creative Writing and Literary Criticism, which one do you have more interest in? Why?
- Q4. Do you think the training opportunity for Literary Criticism and Creative Writing is enough during your tertiary education?
- Q5. What is the ratio of Literary Criticism and Creative Writing in your learning program?
- Q6. How do you study or improve your learning in Literary Criticism and Creative Writing?
- Q7. What is the relationship between Literary Criticism and Creative Writing?
- Q8. What are the similarities and differences between Literary Criticism and Creative Writing?

The above interview questions aim to obtain the educational background and learning experience of the students. Basically, the students should have certain knowledge and experience of both subjects in order to justify the difficulties and relationship of them. Moreover, the learning quality and quantity of two subjects of interviewees are also very important in this investigation, and they reflect the perception of students of literary criticism and creative writing. Also, we would like to know more about the students’ interest and learning practice of these two subjects, for the reason of improvement in student leaning. Lastly, this questioner will also retrieve the points of view of students about the relationship and similarity of these two subjects, which are most important in this study.

12.3 Results

12.3.1 Findings

All student interviewees received trainings of literary criticism and creative writing in university. This explains that they have already acquired certain knowledge of both subjects. According to the interviews, most students are found to have conventional thoughts toward creative writing. They think creative writing is an academic activity that students can express personal opinions and feelings in their writings with a high degree of freedom. There is no limitation or boundary. They also emphasize that literary creation is “unrestricted” and think that personal experience and feelings are the most important elements among others. Some of them even think literary creation does not need basic knowledge. Besides, they also have the impression that “writing skills” cannot be mastered and learned even they have received instructions from school teachers. They share that writing skills can only be enhanced and improved through reading more, writing more, and exchanging ideas and discussing with classmates. The interviews also indicate that not many students suggest creative writing can be improved and enhanced through studying literature theories. Some of the students think that the skills for literary creation, such as writing styles and rhetoric, are difficult to handle. Therefore, they think literary creation is hard to do well although it can be done in a free style.

For literary criticism, students normally think it is easier to master through learning and get good learning results. Most students suggest that studying relevant literature theories and making references to critics’ literary works are ways to enhance skills in writing thesis. Some students also point out that a good literary criticism should have insights, and the insights can only be achieved through reading academic materials.

Most student interviewees point out that literary creation needs creativity while literary criticism needs analytical skills. The two subjects require different abilities. They think literary creation focuses on the sense of aesthetics, personal feelings, and styles, while literary criticism emphasizes on logic, inference, and analytical skills. Some of the interviewees even think literary creation is a production process that transforms one’s thinking into words and languages, so that readers can understand the writers’ thoughts, while the learning objectives of literary criticism is to disassemble the literary creations and let readers understand the theme and texture of the works.

Some students think the learning of literary criticism and that of literary creation should be in order. Literary criticism should be learned before literary creation because good analytical skills and sufficient literature knowledge can help in producing excellent literary creations. In other words, students agree that the learning of literary criticism can enhance writing ability and improve their writing standards in literary creation. However, only a few students point out that the two subjects are actually complementary and interacting with each other. Literature theories would

be applied to both literary creations and criticisms, and during which improvements would also be made.

Although the thoughts and perceptions of most interviewees in these two subjects are rather conventional and traditional, the points supporting that the learning of literary criticism and creative writing are mutually facilitative are found in the interviews. For example, the methods of improving the learning of these two subjects are the same. Student interviewees claimed that there are two ways to improve learning:

Read and practice. Reading is helpful to both Literary Criticism and Creative Writing. When reading literary works, I would learn and appreciate the uses of rhetoric, as well as learn to think and criticize the content and the message being conveyed. Apart from literary works, I also read theoretical books and journals studies, so as to understand the development of literature, to learn to compare between various concepts, and to look for striking inspirations. Practicing is important, especially for creative writing. The process of “write,” “reflect,” and then “rewrite” is an efficient way for me to improve creative writing.

For the relationships between literary criticism and creative writing, some students think that there is an interacting relationship between them, they said:

Literary Criticism strengthens my theoretical foundation in Creative Writing, which helps in polishing my writings and makes them to become more “professional.” On the contrary, Creative Writing helps in developing new views and detailed analyses, which are necessary for Literary Criticism, too.

About similarities of literary criticism and literary creation, students think that both of them are activities of communication that use words to convey messages. They both consist of literature knowledge, inspirations, and personal feelings. A student expressed her opinion as follows:

No matter Literary Criticism or Creativity Writing, they both need literary knowledge, inspirations, strong feelings, and critical thinking. This is the similarity between the two subjects.

The above answers suggest that students understand the relationship and similarity of these two subjects; that is, learning one should have an effect on learning the other.

12.3.2 Self-Reflection

I will begin this part with my observations. As a teacher of Chinese language and literature for higher education, I found most staff members of the faculty do not like teaching writing courses, such as media writing, practical Chinese writing, and, especially, creative writing. Although the teaching staff are experts of analytical study of literature, they show interests in teaching non-writing courses, such as critical theory, historical background, philosophical rigor, sociological framework, and formalist knowledge. In fact, I think the skills acquired from “non-writing”

subjects could also enhance creative writing skills. As I said in the previous sections of this paper, it is impossible to determine an artist or a critic comes first. Literary criticism equips students to understand and interpret creative writings and masterpieces. They create poems, prose, and fictions and then act as critics to review their own and classmates' works, in order to receive comments for improvements. Since creative writing also needs to analyze and criticize, the proficiency of analytical skills will affect the quality of writings. According to my teaching experience, the opportunity for students to share and discuss their writings and masterpieces in groups is one of the most important components in creative writing courses.

There are three learning outcomes of creative writing course from EdUHK: (1) to write with careful observation; (2) to create poems, prose, and short stories; and (3) to share the experience of reading and writing creative works. The component of literary criticism is absent from the course while students learn about literary modes, literary conventions and stylistic devices through creative writing course, and being familiar with contemporary literary scenes instead.

Some teachers may claim that creative writing is a new presence in learning Chinese literature, with its objectives, values, and teaching methods quite different from conventional ones. But why do the Bachelor of Arts and Master of Arts in Creative Writing have become popular in recent years while some universities in Hong Kong even established the department of creative writing (e.g., Department of Humanities and Creative Writing, Hong Kong Baptist University)? In fact, to or not to separate creative writing from conventional Chinese language and literature learning as an independent discipline is one of the current dilemmas. For me, as a teacher of both literary criticism and creative writing, I think the learning of the two subjects can be incorporated. They are accompanying one another. Although creative writing requires students to create themes of works, literary styles, and formats with interesting thoughts, their innovative ideas cannot be generated only from their talents, imaginations, and sensibility without understanding the history of literature and appreciating exemplars of creative writings. Thus, this learning process is also common to conventional literature education, which focuses on analytical study of literature.

Apart from the different learning and teaching approaches between creative writing and conventional literature education (to restate, I think the two subjects can be taught in a similar way), creativity and aesthetic sensibility of creative writers being gifted talents that cannot be taught is also argumentative and is a common misunderstanding among students and teachers. Basically, any kind of writings is a means of expression and communication. Creative writers prefer communicating and sharing with others in an aesthetic way; hence, the studying of literary theories, such as deep images, metaphors, and representations, can actually help them to express and convey ideas in a more effective way. In addition, literary critics are usually having creative minds. In order to express opinions effectively, they need to elaborate ideas with literary theories. Therefore, the knowledge and understanding of literature are crucial to a critic. However, due to conventional learning and

teaching practices, most curriculum designers of creative writing programs have been leery of critical theories in the first place, which lead to an exclusion of this element from the courses as a result.

12.4 Suggestions for Applications to Teaching

12.4.1 Creative Writing

According to the above discussion, a tie-in relationship between literary criticism and literary creation is proven. Therefore, another objective of this paper is to find out a solution that takes care of the two subjects in learning simultaneously.

The course curriculum for literature nowadays is somehow paying particular stress on literary criticism. Students' ability in literature appreciation has become the core and essential part in learning literature. Nonetheless, writing and creations are always regarded as gifted talents that the training for this side is being neglected.

In my classes of literary creations, I try to combine the two subjects together. Therefore, the learning objectives for both are also included in my course arrangement: to provide students with classic masterpieces as exemplars for appreciation and analysis, in order to enhance and improve their criticizing ability. In addition, students can also understand the writers' styles of writing, the structure and style of the works, as well as to comprehend the impacts and status of the literary works from a conventional literature perspective. In this way, students can on the one hand read and learn from more writing works in different styles and on the other hand enrich their understandings about literature conventions and styles. This teaching methodology emphasizes on the similarities of the two subjects. It is different from the current way to teach the two subjects separately.

Appreciating and criticizing peer's writing is another way that I always use in my teaching classes. Through reading, discussing, and evaluating on the writing pieces, students can improve and modify their works to a more aesthetic standard after understanding more about the application and use of language, as well as to learn to master more literature writing skills and rhetoric. Sometimes, I would restrict my students to use particular literature theories or special terms in literary criticism, in order to let students gain more opportunities to do practical literary criticism. Students who study literary creation and teachers of literary criticism usually think "creation" is nothing related to literature theories. However, in fact, having good knowledge of literature theories does help in understanding others' creation, as well as doing our own creative writings.

The study of literature history can also be conducted in literary creation classes. When students have discussions on their writings, they would analyze the styles and formats of the writings, and to compare them with some masterpieces produced in particular periods. This allows students to have a touch on different writing styles from different periods, as well as to understand more about the genres of writings.

Meanwhile, students can also study the uniqueness and features of various kinds of literary works during evaluations, to identify and understand the limitation and features of different genres.

Moreover, “creation” is always regarded as a personal activity. Many students and teachers think creative writing can be done inside a locked room. In my classes, I promote “group creation.” For example, I would divide the students into small groups and ask the first group to create a stanza/line of a poem. Then, the following groups create the following stanzas/lines until the poem is completed. Similarly, I would instruct my students to write a story by creating the plots one by one together. During the process, students need to understand and evaluate the works from the previous groups, in order to continue creating the poem or story. When the creation is completed, I would then divide the students into two groups to debate on the good and bad of the final product. Most students think this learning process is interesting, during which they enhance their abilities and skills in literary writing and study, also it helps them to bring the literary analysis into a more in-depth one.

Due to the misunderstanding and conventional thoughts on literary creation, most students think it is difficult. They are not willing to touch on it. In Hong Kong, students always think “creative writing” needs gifted talents. In fact, the objective of this subject is to encourage students to use words and language to express their feelings in an aesthetic way, as well as to understand the theories, conventions, and features of literature. Therefore, it is suggested to emphasize the following in the teaching objective: Creative writing is an advanced subject to basic practical writing, which includes theories on literary creation and criticism. Its learning outcome—the student’s work—does not need to be as excellent as those created by professional writers. In this regard, students would become devoted to “creation”.

12.4.2 Literary Criticism

Theoretically, no one can determine whether theory of literature consists of both writer’s theory and critic’s theory. However, no matter for literary creation or literary criticism, it is no doubt that learning in a systematical way can bring improvement to writing. A number of critics suggested that literary creation needs a lot of practices, but not many of them raised the importance of practice to literary criticism.

Actually, thesis writing is one kind of genres. It needs to apply particular languages, formats, and styles of presentations that student might not be able to master them well as the skills cannot be gifted. Therefore, when students try to produce one of the learning outcomes for literary criticism—commentary, tutorials, guidance, and practices in schools are also needed. In my opinion, the recent teaching for literary criticism is not ideal. It focuses on the study of literature theories and masterpieces during classes and requests students to submit a thesis when the learning program is completed. As I said before, thesis writing is a genre that needs particular standards in writing. Conventional teaching in literature and literary

criticism do not focus on how to do researches; how to present opinions and points of views; how to organize the structure of writing; and how to prove and extrapolate the relationship between the contention and the basis of an argument. In fact, all these components are good opportunities to allow students to read more exemplars and thesis, as well as to learn the keys and skills for writing thesis. In short, like creative writing, reading and practicing are also the ways to improve skills of critical writing.

Many students and teachers think literary criticism is “serious.” However, it also needs “creativity” when discussing and thinking about the perspective of questions, thinking about images to compare during literature comparisons, and finding out solutions, etc. Therefore, the study, initiatives, and imagination for “creative thinking” are in fact necessary elements for literary criticism. The elements of creative thinking should be included in the classes of literary criticism. Creation and criticism are interlocking and influential to each other, so we cannot simply divide students’ abilities in studying literature into two streams: either criticism or creation.

Generally speaking, graduates from Arts faculty are requested to submit honors projects on a topic of literary criticism, such as criticisms on classical literature, criticisms on modern literature, and the study on literature theories. This convention emphasized students’ knowledge about literature as well as their understandings on literature theories. However, as discussed in this paper, no matter thesis writing or literary creation, they both cover various knowledge and abilities of literature. Therefore, I think it is also feasible for graduates to submit their “literary creation” as final projects, and give them opportunities to present the reasons behind the creations; analyze the structure of their works; present the process of creation; and introduce the schools of literature of their works, so that the students can display their understanding and knowledge of literature and writing. It is practicable to evaluate the standards and learning outcomes of graduates from the Bachelors of Arts.

12.5 Conclusion

In recent years, the focus is much more on learning than teaching in the field of education. How to enhance students’ learning experience becomes more and more important. In this article, we: (1) discussed the relationship, difference, and similarity of literary criticism and creative writing; (2) tried to understand more about students’ educational background, learning experience, and perception of these two subjects; and (3) suggested teaching and learning practices to compromise the two subjects. The aim is to look for better ways for students to learn. For literature education, we hope that students have good performance in literary criticism and creative writing, and therefore, we emphasize the relationship between both of them, and also try to adopt new approach to teach the two subjects based on

students' learning practice, in order to create significant learning experience for students.

There is a fact that many of us know: Most literary stalwarts are creative writers as well as critics. It is indeed an evidence to suggest that creative writing and literary criticism are related to each other. We are not pushing our students to become literary stalwarts, but someone who can and express feelings with imagination and aesthetic sensibility, and understand more about literature theories through practicing creating writings and literary criticism.

Chapter 13

Autonomous Vocabulary Learning Beyond the Classroom: New Media for Learners of Chinese as a Second Language

Shan Wang and Xiaojun Li

Abstract Vocabulary plays a vital role in second-language acquisition. Currently, most research only focuses on how to teach and learn Chinese words in class. The autonomy of learners out of class is ignored, and there is no guidance of what and how to learn vocabulary beyond classroom. This study explored autonomous learning beyond the classroom through using new media, which can help learners to enlarge their receptive and productive knowledge of vocabulary, and it is a very important complement to the in-class learning for Chinese as a second-language (CSL) learner. After introducing the reasons that CSL learners require beyond classroom learning and comparing the differences of using new media and textbooks, this study provided a full guidance of learning vocabulary autonomously after class through demonstrating three learning plans for the three types of new media (E-texts, streaming media, and social media), respectively. It also discussed the payoffs and pitfalls and suggested the criteria for selecting learning materials. In this way, students who learn from authentic contexts can greatly improve their language abilities.

Keywords Autonomous learning · Vocabulary · New media · Chinese as a second language (CSL) · Beyond the classroom

13.1 Introduction

Traditionally, Chinese as a second-language learning focuses on in-class learning, especially what and how to teach and learn. Though such practice guarantees in-class quality of learning, it ignores students' out-of-class autonomy, which should be student-centered, rather than teacher-centered. Furthermore, vocabulary learning is a very important and quite hard part for learners when they learn a

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second language (Richards, 1976). Without vocabulary accumulation, they cannot even express their own views properly. However, in-class learning is limited to textbooks, which is far from enough for learners.

This paper is set out to explore using new media to carry out autonomous vocabulary learning out of class. It classifies new media into three types (E-texts, stream media, and social media) according to the contents. The study seeks to answer these questions: (i) Why CSL learners require out-of-class learning?, (ii) Compared to using textbooks in class, what are the differences of using new media out of class?, (iii) What principles should learners know?, (iv) How to apply new media to learn vocabulary?, (v) What are the payoffs and pitfalls of using media after class?, and (vi) What kind of resources are useful?

This study aims to help CSL learner autonomously learn vocabulary through new media. The remainder of this paper is structured as follows: Sect. 13.2 reviewed the related research; Sect. 13.3 discussed the reasons why CSL learners need out-of-class learning; Sect. 13.4 compared the differences between new media and textbooks; Sect. 13.5 proposed principles for learners; Sect. 13.6 elaborated the learning plans of using the three types of new media; Sect. 13.7 introduced the payoffs and pitfalls of learning after class; Sect. 13.8 presented some evidence of student learning; and Sect. 13.9 summarized the whole paper.

13.2 Related Research

This section reviews related research from three respects: autonomous learning, vocabulary learning, and new media.

13.2.1 *Autonomous Learning*

Holec (1981) defined learner autonomy as the ability to take charge of one's own learning and to hold the responsibility for all decisions concerning all aspects of learning. Dickinson (1987) elaborated the definition of autonomy as the situation in which the learner is totally responsible for all decisions concerned and the implementation of those decisions. Little (1991) further stated that autonomous ability is a particular kind of psychological relation to the process and content of his learning, and it also includes a capacity for detachment, critical reflection, decision-making, and independent action. Cotterall (1995) argued that autonomy should be defined as an ability to use a set of tactics for taking control of their learning, and the tactics would seem to include tactics for setting goals, choosing materials and tasks, planning practice opportunities, and monitoring and evaluating the process. Benson and Voller (1996) held that autonomous learning is a behavior of independent learning and a control of one's learning content. The autonomy of language learning includes three aspects: (i) a behavior processing language autonomy

learning, (ii) an internal mental function conducting language learning, and (iii) an ability controlling and adjusting the learning contents.

From the above scholars' definitions, it is clear that autonomous learning demands that the learners possess the characteristics of independence, dominance, and initiative. This study will explain the process of autonomous learning by following Holec's theory and illustrating with three examples of using new media.

13.2.1.1 Monitoring in Autonomous Learning

Autonomous learning cannot do without autonomous monitoring. Lin and Feng (1999) summarized ten self-monitoring methods: (i) determining the objectives and designing the plans; (ii) initiatively searching for the knowledge; (iii) recording and monitoring; (iv) practicing and memorizing; (v) self-managed awards and punishments; (vi) seeking for others' help; (vii) self-checking and self-assessment; (viii) forecasting the outcomes of learning; (ix) re-organizing the knowledge; (x) arranging the learning environment. Zhang and Wu (2004) subdivided learners' in-class self-monitoring into three stages dynamically. (i) Monitoring of pre-learning activities: In this stage, the self-monitoring indicates learners' plans and preparation for their own learning activities. (ii) Monitoring of in-learning activities, including learners' consciousness, option, and execution. 'Consciousness' means the learning targets, learning objectives, and the specific tasks in the process of learners' learning activities; 'option' means choosing a proper learning strategy; 'execution' is to make sure the activities go with a swing. (iii) Monitoring of after-learning activities, including the feedback, remedies, and some other measures for the learning activities.

The three in-class monitoring stages mentioned in Zhang and Wu (2004) are also applicable to out-of-class learning. In this paper, the monitoring of autonomous learning with e-texts and streaming media is based on the three stages of Zhang and Wu (2004), combined with the methods of Lin and Feng (1999). In addition, when learning with social media, this study suggested using self-monitoring and peer-monitoring.

13.2.1.2 Evaluation in Autonomous Learning

Self-assessment is often used as an evaluation method in autonomous learning. Boud and Falchikov (1989), Klenowski (1995), and Noonan and Duncan (2005) viewed self-assessment as a judgment of one's performance in learning and the identification of the achievements and weaknesses. Self-assessment is a test as well as a judgement for the learning process and behavior. In accordance with this kind of definition, the primary goals of learners in self-assessment are to promote self-regulation and to boost learning and achievement (Andrade & Valtcheva, 2009; Pintrich, 2000). Andrade and Valtcheva (2009) described self-assessment as a process of formative assessment during which students reflect on the quality of their work, judge the degree to which it reflects explicitly stated goals or criteria, and

revise accordingly. Self-assessment of different skills can produce different results. Ross (1998)'s summary of the meta-analysis suggested that learners could self-assess their receptive skills, such as reading and listening skills, more accurately than their productive skills, such as speaking and writing skills. Among the four skills, students made most accurate self-assessment in reading.

In addition to self-assessment, this study in Sec. 13.6 *Applications* also suggests peer assessment to evaluate what has been acquired.

13.2.2 Vocabulary Learning

Vocabulary is a significant part of a language and is the core of second-language acquisition. Just as British linguist Wilkins (1972) said, 'Without grammar, little can be conveyed; without vocabulary, nothing can be conveyed'. Vocabulary knowledge plays a crucial role in the receptive and productive skills associated with effective communication.

13.2.2.1 The Contents of Vocabulary Learning

Scholars consider that the following contents should be included in vocabulary learning: (i) the written and oral form of the vocabulary; (ii) the usage frequency of the vocabulary; (iii) the derived forms of the vocabulary; (iv) the semantic features of the vocabulary; (v) the syntactic features of the vocabulary; (vi) the function of the vocabulary in the context; (vii) the collocation (Cohen, 1990, among others).

Apart from these, the vocabulary of a person is divided into receptive and productive vocabulary (also called passive and active vocabulary by some scholars) (Meara, 1990; Corson & Corson, 1995, Nation, 2001). Nation (2001) discussed what is involved in knowing a word, including form, meaning, and usage. When designing the applications in Sect. 13.6, this paper made reference to Nation (2001) as learning objectives and suggested different methods to achieve them.

13.2.2.2 Vocabulary Learning Strategies

Previous research on vocabulary learning strategies has yielded insightful results. The frequently used and effective strategies are summarized as follows: (i) looking up dictionaries (Gu & Johnson, 1996; Schmitt, 1997; Fan, 2003); (ii) repeatedly memorizing (Schmitt, 1997; Lawson and Hogben, 1998); (iii) guessing from the context (Gu & Johnson, 1996; Fan, 2003); (iv) practicing and communicating (Liu, Lan, & Jenkins, 2004; Arjomand & Sharififar, 2011); (v) taking notes (Gu & Johnson, 1996; Liu et al., 2004); (vi) translating (Liu et al., 2004); (vii) summing up (Liu et al., 2004); (viii) associating (Schmitt, 1997); (ix) morpheme analysis (Liu et al., 2004).

All the strategies mentioned above can be used for out-of-class vocabulary learning. Based on them, this paper elaborates the strategies of autonomous vocabulary learning using new media.

13.2.3 New Media

This section introduces new media's definition, classification, influences, and their relation with vocabulary learning.

13.2.3.1 The Definition and Classification of New Media

With the development of science and technology, new media are emerging as new learning tools. They are based on digital technology which spreads information through networks. Wang (2012) explained that new media are dependent on computers, mobile devices, and digital televisions and they are characterized by mobility, real time, and interaction.

This paper treats new media as the digital media which distinguish themselves from the traditional media. They possess abundant materials for learning. Their main carriers are computers and mobile devices. In terms of the forms of the contents, this study divides them into three types:

- (i) E-texts: The forms of the contents are mostly word- and picture-like e-newspapers and e-magazines, which are materials that people can read;
- (ii) Streaming media: The forms of the contents are mainly videos and audios, which are materials that people can watch or listen to;
- (iii) Social media: The forms of the contents are mainly interactive like WeChat, Weibo (mini-blog), e-mail, or forums.

13.2.3.2 The Influences of New Media

New media are characterized by rapid update, information, low cost, and convenience. They are popular especially among young people. Mobile devices, which are handheld computers that can be accessed regardless of time and location, have the potential of revolutionizing the role technology plays.

New media are popular as information-spreading tools. In addition, they can assist in out-of-class learning. For example, for the use of a Web-based medium for the out-of-classroom support of student learning, Lee et al. (2005) attempted to measure students' acceptance of such a learning medium within a motivational framework in terms of two main factors: extrinsic (perceived usefulness and ease of use) and intrinsic (perceived enjoyment) motivations. The findings show that apart from

perceived ease of use, both extrinsic motivation and intrinsic motivation are linked to attitudes of students and their intention to use a Web-based learning medium.

13.2.3.3 New Media and Vocabulary Learning

Regarding the vocabulary learning with new media, existing research mainly focuses on the effects of podcasts and vodcasts. Most studies have the evidence supporting the use of podcasts and vodcasts for educational purposes. Hew and Cheung (2013) found podcasts (audio-only files) and vodcasts (audio and video files) have several advantages for vocabulary instruction. First, the static nature of podcasts and vodcasts make them a favorable pre-instructional strategy to in-depth word analysis or a tool for reviewing previously taught words. Second, podcasts and vodcasts, which are on teacher-provided instruction, can be accessible and viewed at any time when downloaded to a mobile device. Third, the content of podcasts and vodcasts can be structured to allow the students to be exposed to multiple new words to broaden their horizon.

In addition, there are studies reporting the delivery of the text-only learning materials via MMS (multimedia messaging service) feature of mobile phones (Lee et al., 2005; Stockwell, 2007; Thornton & Houser, 2005). For example, Stockwell (2007) investigated the effectiveness of multimedia learning materials that integrate verbal and visual information using the MMS feature of mobile phones.

However, studies employing the use of new media outside the classroom are rarely seen (Wang & Liu, 2016). In order to promote the effective use of new media out of class, this paper targets at the autonomous vocabulary learning of CSL learners and the design of applications for them.

13.3 Reasons that CSL Learners Need Out-of-Class Language Learning

Out-of-class learning has many advantages over in-class learning.

- (i) More time and less stress: CSL learners have limited in-class learning time, and they are sometimes controlled by the examination. However, learners have no worry about the time and stress problem when they learn the vocabulary outside classroom, which is beneficial for them to learn more vocabularies.
- (ii) More communicative: For CSL learners, the words in the textbooks just have some basic explanation, and there are not many communicative materials to provide effective and adequate contextual practice. In contrast, the new media offer greater opportunities for authentic language use.
- (iii) More interesting: Chinese language learning in classroom is relatively boring without vivid pictures or voices in which the learners are easy to lose interests. But learning through new media is quite different as more diversified forms are added.

- (iv) More initiative: The in-class language learning is dominated by the teachers as we say ‘teacher-centered’, while the outside classroom learning is ‘learner-centered’, who has autonomy in choosing their learning materials according to their own requirements.
- (v) More choices: The CSL learners are restricted to learn the words in the textbooks in classroom while outside the classroom they can learn whatever types of words they want to know, such as cultural, economic, and artistic words. You name it, they have it.

13.4 Differences Between New Media and Textbooks

Various types of new media are the carrier of out-of-class autonomous learning suggested in this paper. In contrast, the major carrier of in-class learning is always the textbook. New media can complement textbook. This section discusses their differences from the eleven dimensions put forward by Nunan (2015) and Nunan and Richards (2015): location, modality, skill, learning aims, control, type of interaction, language register, logistics, task demands, manner, and resources. Based on these dimensions, new media and textbook demonstrate differences in many ways. New media play a crucial role for learners to learner Chinese beyond the classroom, as indicated in Table 13.1.

Table 13.1 Comparison between new media and textbook

Items	New media			Textbook
	e-texts	Streaming media	Social media	
Location	Everywhere	Everywhere	Everywhere	In class or at home
Modality	Writing	Speech	Writing and speech	Writing
Skills	Reading	Listening	Reading, writing, listening, speaking	Reading
Learning aims	Specific or general; intentional or incidental	Specific or general; intentional or incidental	Specific or general; intentional or incidental	Specific; intentional
Control	Mostly learner-managed	Mostly learner-managed	Mostly learner-managed	Mostly teacher-initiated
Type of interaction	Mostly one-way interaction	Mostly one-way interaction	Multi-way interaction	Mostly one-way interaction
Language registers	Either formal or informal	Either formal or informal	Mostly informal	Formal and canonical language use
Logistics	Complex	Complex	Complex	Gradual arrangement: from easy to difficult
Task demands	Self-regulated tasks	Self-regulated tasks	Self-regulated tasks	Teacher-mediated tasks
Manners	Mostly individual	Mostly individual	Interactive	Individual
Resources	Enormous	Enormous	Enormous	Limited and fixed

13.5 Principles of Applying New Media to Learn Vocabulary Autonomously

This study proposes five Dos and five Don'ts as the ten principles for learners when they learn vocabulary autonomously through new media.

Dos:

Principle 1. Learners should take full control of all the aspects of learning.

Principle 2. Learners need access to the canonical materials.

Principle 3. Learners should review what they have learned.

Principle 4. Learners should find opportunities to practice what they have learned.

Principle 5. Learners should persist for some time.

Don'ts

Principle 1. Don't be overwhelmed by the possible difficulty at the beginning.

Principle 2. Don't forget to refer back to the five aspects of learning (Holec, 1981).

Principle 3. Don't learn fast and forget faster.

Principle 4. Don't fear to make mistakes.

13.6 Applications

Learners should have in mind what they want to achieve when using new media in their vocabulary study. Holec (1981) proposed five aspects in autonomous learning: (i) determining the objectives, (ii) defining the contents and progressions, (iii) selecting the methods and techniques to be used, (iv) monitoring the procedure of acquisition, and (v) evaluating what has been acquired.

Suppose the objective of learners is to learn the new words from the three types of new media: e-texts, streaming media, and social media. Following Nation (2001), if the learners want to know the receptive and productive knowledge of the form, meaning and use of the new words, they can determine the objectives as follows:

Form

Learners can spell and write the selected words accurately.

Meaning

Learners know the meaning of the selected words and can explain them in their own words; learners can recognize the morphemes of the selected words; find out their meaning and use them in other occasions; learners know the associated words of the selected words, such as their synonyms, antonyms, and homonyms.

Use

Learners know the parts of speech of the selected words and can judge their functions in sentences; learners know the collocation of the selected words; learners can decide the contexts that the selected words are used.

With these objectives in mind, this study suggests the following design when learners use the three types of new media (E-texts, streaming media, and social media), respectively, from other four aspects (Holec, 1981).

13.6.1 E-Texts

This part takes a piece of news on *China Daily* named 《立秋习俗:吃肉“贴秋膘”“咬秋”抒发丰收喜悦》¹ *Lìqiū xísú: Chī ròu “tiē qiū biāo” “yǎo qiū” shūfā fēngshōu xǐyuè* ‘The costumes at the beginning of the autumn: People celebrate the harvest through eating melons and meat’ as an example, and describes specifically the autonomous learning process from other four aspects (Holec, 1981).

(i) *Defining the contents and progressions*

- (a) Read through the whole news and make extracts of the words that you are interested into an electronic document like Microsoft Word or the memo in your iPad.
- (b) Look up the dictionary to know the words’ pronunciation, writing, part of speech, meaning, collocations, synonyms and illustrative sentences. Such information can be tabulated. Here, we take 预示 *yùshì* ‘foresee’ from the news as an example and the tabulation is as follows:

【预示】²

Items	Information	Translation
Pinyin	<i>yùshì</i>	<i>yùshì</i>
Part of speech	动词	Verb
Meaning	事前显示出来	Foresee
Collocation	预示 + 现象类: 预示着危机、预示着效果	预示 <i>yùshì</i> ‘foresee’ + phenomenon: 预示着危机 <i>yùshìzhe wēijī</i> ‘indicate the crisis’, 预示着效果 <i>yùshìzhe xiàoguǒ</i> ‘suggest the effect’
Synonym	预见、表示	预见 <i>yùjiàn</i> ‘predict’, 表示 <i>biǎoshì</i> ‘express’
Sentences in the news	立秋一般预示着炎热的夏天即将过去, 秋天即将来临。	<i>Lìqiū yībān yùshìzhe yánrè de xiàtiān jíjiāng guòqù, qiūtiān jíjiāng lái lín</i> ‘The beginning of the autumn generally betokens the pass of the hot summer and the coming of the autumn’

(continued)

¹http://cnews.chinadaily.com.cn/2015-08/08/content_21536533.htm, accessed on 31 August 2015.

²The learners only need to tabulate the first two columns; the third column ‘Translation’ is for non-Chinese readers’ reference. The tables of 融合 *rónghé* ‘integrate’ and 忙碌 *mánglù* ‘busy’ are the same.

(continued)

Items	Information	Translation
Other sentences	(1) 天空乌云密布, 这预示着要下一场大雨。	(1) Tiānkōng wūyún mibù, zhè yùshìzhe yào xià yī chǎng dàyǔ 'The sky is cloudy, which foresees a heavy rain'
	(2) 花都开放了, 树叶渐渐茂盛, 这预示着夏天就要来了。	(2) Huā dōu kāifāngle, shùyè jiànjiàn màoshèng, zhè yùshìzhe xiàtiān jiù yào láile 'The blossom of the flower and the gradual flourishing of the leaves foresee the coming of the summer'
	(3) 春节鞭炮声响, 这预示着来年一定红红火火。	(3) Chūnjié biānpào shēngxiǎng, zhè yùshìzhe láinián yīdìng hónghónghuǒhuǒ 'The firecrackers during the Chinese new year indicates that the coming year is booming'

- (c) Retell the content of the news according to the vocabulary notes. For example, this selected news is about the customs of the beginning of the autumn, so when you retell the news, you can use the word 预示 *yùshì* 'foresee' to make a sentence “立秋预示着炎热的夏天即将过去。” *Lìqiū yùshìzhe yánrè de xiàtiān jǐjiāng guòqù.* 'The beginning of the autumn betokens the pass of the hot summer'.
- (ii) Selecting the methods and techniques to be used
- (a) The discovery method: It means that you should make clear the meaning and usage of the words by yourself. Take 预示 *yùshì* 'foresee' as an example, the learners should look up the dictionary to find out its meaning, part of speech, and usage. The learners should also analyze the context for the usage of the word in the news.
- (b) The morpheme analysis method: The word 预示 *yùshì* 'foresee' has two morphemes: 预 *yù* and 示 *shì*. 预 *yù* means 'pre-', so you can associate it with 预习 *yùxí* 'preview', 预备 *yùbèi* 'prepare' and 预言 *yùyán* 'predict' and so on, while 示 *shì* means 'know', which can be used in 演示 *yǎnshì* 'demonstrate', 表示 *biǎoshì* 'express', and 指示 *zhǐshì* 'indicate'. Learners should also realize that some morphemes are polysemous. For instance, 休 *xiū* in the sentence 今日立秋, 百病俱休 *jīnrì lìqiū, bǎibìngjùxiū* 'Today is the beginning of the autumn, and thus sickness stops.' means 停止 *tíngzhǐ* 'stop', so you can also say 休业 *xiūyè* 'stop the business', but it is wrong when you associate this 休 *xiū* with 休息 *xiūxi* 'take a rest', as here 休 *xiū* means to take a rest.
- (c) The association method: When you learn a new word, you should put the word into a specific context and associate the things related to it. For example, when you are learning the word 预示 *yùshì* 'foresee', you can imagine the hot summer has gone, the leaves begin to fall, the flowers are

withering, and the weather becomes cool, and thus people wear more clothes. All the phenomena foresee that the autumn is coming. Here, you can use 预示 *yùshì* ‘foresee’.

- (d) The classification method: The words should be summed up in terms of the meaning, part of speech, and so on. In this way, the learners can memorize more words related to the selected word. For example, there are many words about 秋 *qiū* ‘autumn’, like 秋膘 *qiūbiāo* ‘putting on weight in autumn’, 立秋 *liqiū* ‘the beginning of the autumn’, 秋季 *qiūjì* ‘autumn’, 秋天 *qiūtiān* ‘autumn’. The learners can write up these words together.
- (iii) *Monitoring the procedure of acquisition*
- (a) Monitoring before learning: Learners should pick up the learning materials, the ways of learning, and the learning strategies to guide their own learning.
- (b) Monitoring during learning: Learners should take notes to record the learning process and take control of the time. For example, when you learn the word 预示 *yùshì* ‘foresee’, you should take complete notes and push yourself to memorize the new words.
- (c) Monitoring after learning: Learners should review the words again and again, and check the outcome when you come across the words or use them in communication.
- (iv) *Evaluating what has been acquired*
- (a) The students can make an assessment of learning in terms of the time used, the number of words, and the effects of learning.
- (b) Make an electronic learning document: the learners can make notes into the electronic document with specific date as an evidence of the learning process.

13.6.2 Streaming Media

This part is analyzed based on the passage named 《李小龙与中国功夫》³ *Lǐxiǎolóng yǔ Zhōngguó gōngfū* ‘Bruce Lee and Chinese Kungfu’ from the Slow Chinese.

- (i) *Defining the contents and progressions*
- (a) Listen to the story twice and record the words you do not understand by using Pinyin.
- (b) Guess the words you do not understand according to the context and then write down the right words to the electronic document by referring to the written version of this passage.

³<http://www.slow-chinese.com/podcast/145-li-xiao-long-yu-zhong-guo-gong-fu/>, accessed on 31 August 2015.

- (c) Look up dictionaries to make clear the words' part of speech, meaning, collocations, synonyms, and illustrative sentences. All the contents can be tabulated. Here, we take 融合 *rónghé* 'integrate' for example, and the tabulation is as follows:

【融合】

Items	Information	Translation
Pinyin	<i>rónghé</i>	<i>rónghé</i>
Part of speech	动词	Verb
Meaning	熔成或如熔化那样融成一体	Integrate
Collocation	融合中西方文化、融合古今	融合中西方文化 <i>rónghé zhōngxīfāng wénhuà</i> 'integrate Chinese and western culture', 融合古今 <i>rónghé gǔjīn</i> 'integrate the past and the present'
Synonym	调和、协调	调和 <i>tiáohé</i> 'mediate', 协调 <i>xiétiáo</i> 'coordinate'
Sentence in the essay	截拳道融合了中国的道家思想。	Jiéquándào <i>rónghéle</i> Zhōngguó chuántǒng de dàojiā sīxiǎng 'Jeet Kune Do integrated Chinese traditional Taoism'
Other sentences	(1) 这家店的设计风格融合了 <u>中国元素</u> 和 <u>欧洲元素</u> 。	(1) Zhè jiā diàn de shèjì fēnggé <i>rónghéle</i> Zhōngguó yuánsù hé Ōuzhōu yuánsù 'The design of this shop integrates the Chinese elements with European elements'
	(2) 李小龙将功夫 <u>融合</u> 了道家思想。	(2) Lǐxiǎolóng jiāng gōngfū <i>rónghéle</i> dàojiā sīxiǎng 'Bruce Li integrates the Chinese Kung Fu with Taoism'

- (d) Read the written version of the story and memorize the selected words through using the tabulated information.
- (e) Listen to the video again and check whether you can comprehend the main idea of the story.
- (f) Retell the main idea of the story by using the selected words.
- (ii) *Selecting the methods and techniques to be used*
- (a) The Guessing method. Listening to or watching the video is meant to improve the listening and speaking abilities. Thus if you come across the words you have never met, you should guess the meaning through the context, after which you can look up dictionaries to check whether your guess is correct or not. Take the word 低潮 *dīcháo* in this passage for example. If you do not know the meaning of the word, you can guess it from the context. This word appears in the sentence:

他的突然过世, 使功夫电影也陷入低潮, 直到八九十年代, 才出现了李连杰和成龙两位闻名世界的功夫明星。

Tā de túrán guòshì, shǐ gōngfū diànyǐng yě xiànrù dīcháo, zhídào bāijiǔshí niándài, cái chūxiànle Lǐliánjié hé Chénglóng liǎng wèi wénmíng shìjiè de gōngfū míngxīng.

‘His sudden death made the Kungfu movies fall into a low tide and it was until 1980s and 1990s that appeared two world-famous Kung Fu stars Jet Li and Jackie Chan.’

From it, you can notice the expressions like 突然去世 *tūrán qùshì* ‘die abruptly’ and 直到 *zhídào* ‘until’, and then you may guess the word 低潮 *dīcháo* means slow development or very low point. Finally, you should look up the dictionary and ensure the accurate meaning ‘in a low or stagnant phase’.

- (b) The audio-lingual method. The learners should listen to the materials again and again and imitate the pronunciation of the words so as to acquire the words through listening and speaking.
 - (c) The contextual method. It is of great importance for learners to comprehend the words in a specific context. For example, the word 截拳道 *jiéquándào* ‘Jeet Kune Do’ is a new word, even many Chinese do not know exactly how it is played, but if you learn the word in this story, you will find that it is a kind of Kung Fu created by Bruce Lee and is combined with the Chinese traditional Taoism. That is enough for knowing the meaning of this word.
- (iii) *Monitoring the procedure of acquisition*
- (a) Monitoring before learning: Learners should pick up the learning materials, the ways of learning, and the learning strategies to guide their own learning.
 - (b) Monitoring during learning: Learners should take notes to record the learning process and take control of the time. For example, when you learn the word 融合 *rónghé* ‘integrate’ you should take complete notes and push yourself to grasp it.
 - (c) Monitoring after learning: Learners should review the words again and again, and check the outcome when you come across the words or communicate with others.
- (iv) *Evaluating what has been acquired*
- (a) Evaluating through reviewing: After a period, the learner can select some videos that are already watched at random to check whether you can understand them or not.
 - (b) Evaluating through making an electronic learning document: The learners should make notes into the electronic document with specific dates as an evidence of the learning process and make necessary adjustments where applicable.

13.6.3 Social Media

Suppose the learners want to pass the new HSK ‘Chinese Proficiency Test’ of the sixth level (Hanban/Confucius Institute Headquarters, 2010). They can build a WeChat group to propel one word every day and discuss with other learners.

(i) *Defining the contents and progressions*

- (a) Select the words at the sixth level that you want to share with your friends.
- (b) Look up dictionaries to make clear the words’ part of speech, meaning, collocations, related words, and illustrative sentences. Suppose a learner is learning the sixth-level word 忙碌 *mánglù* ‘busy’ of the new HSK, he/she should find the following information.

【忙碌】

Items	Information	Translation
Pinyin	<i>mánglù</i>	<i>mánglù</i>
Part of speech	形容词	Adj.
Meaning	忙着做事, 不得空闲	Busy
Collocations	忙碌的生活、忙碌的工作	忙碌的生活 <i>mánglù de shēnghuó</i> ‘busy life’, 忙碌的工作 <i>mánglù de gōngzuò</i> ‘busy work’
Synonyms	繁忙、劳碌	繁忙 <i>fánmáng</i> ‘busy’, 劳碌 <i>lǎolù</i> ‘toil’
Antonyms	清闲、悠闲	清闲 <i>qīngxián</i> ‘at leisure’, 悠闲 <i>yōuxián</i> ‘at leisure’
Sentences	(1) 尽管工作忙碌, 他还是抽出时间和家人相处。	(1) Jǐnguǎn gōngzuò <u>mánglù</u> , tā háishi chōuchū shíjiān hé jiārén xiāngchǔ ‘Notwithstanding the busy work, he still spends time with his family’
	(2) 忙碌的生活让她觉得内心充实。	(2) <u>Mánglù</u> de shēnghuó ràng tā juéde nèixīn chōngshí ‘The busy life makes her feel enriched’

- (c) The learner can propel the above information of 忙碌 *mánglù* ‘busy’ to the WeChat group and interact with friends about how to use it. For instance, he/she can ask them questions, practice the words by making sentences, and make comments on each other’s reply.
- (d) Make notes of all the words you have learnt through putting them into an electronic document.

(ii) *Selecting the methods and techniques to be used*

- (a) The demonstration method: Learners can present the selected words in whatever ways they want to, such as wording, pictures, radios, or videos. For example, if a learner wants to propel the word 忙碌 *mánglù* ‘busy’ in a video, he/she should know its meaning and conceive what he/she want to film.

Then, he/she can pick the spot or people to shoot a small video. Learners can also find some pictures to illustrate the word just like the following picture. In addition, they can tell a story in their life related to 忙碌 *mánglù* 'busy' to explain it.

- (b) The interaction method: Learners should make comments or give their feedbacks to their friends about the words propelled and learn the vocabulary during the discussion.
- (iii) *Monitoring the procedure of acquisition*
- (a) Self-monitoring: Learners should push themselves to propel the word regularly according to their learning plan.
 - (b) Peer monitoring: Learners in the WeChat group may select someone as an administrator who will rank the learners according to the number of propelled words and urge those who are lagging behind.
- (iv) *Evaluating what has been acquired*
- (a) Peer assessment: The learners in the group can set up evaluation standards such as the number of words, the quality of the words' information, and the comments they have made. They can appraise the person who do the best.
 - (b) Evaluating through making an electronic learning document. The learners can make notes of the selected words and put them into the electronic document with specific dates as an evidence of the learning process. Necessary adjustments could be made where applicable.

13.7 Payoffs and Pitfalls

Learning Chinese vocabulary through new media in the out-of-class environment has both payoffs and pitfalls. It has quite a number of payoffs: (i) learners can acquire a certain number of vocabulary through autonomous learning to enlarge the volume of their vocabulary; (ii) learners can take more interest in vocabulary learning by using new media; (iii) learners can have more knowledge about some topics and improve their Chinese language skills by regularly learning vocabulary; (iv) learners can put the words into practice accurately instead of simply memorizing them by note; (v) learners can complement the school learning more easily.

It could also have pitfalls. Due to the difference in learning abilities, the effects of autonomous learning beyond the classroom must be different. For example, though the vocabulary notebook is a good strategy for learners to keep record of their learning, some students cannot persist. The autonomous learning would be more effective if assistance is provided.

Benson, Grabe, and Stoller (2001) propose five principles for accomplishing autonomous learning: (i) active involvement by students in their own learning;

(ii) providing options and resources; (iii) offering choices and decision-making opportunities; (iv) supporting learners; and (v) encouraging reflection. Therefore, if teachers can involve in students' out-of-class learning acting as guides and counselors, they can achieve better learning effect. Teachers can provide help to them through these ways: (i) providing some canonical resources for students to learn; (ii) recommending more methods to learn the new words; (iii) encouraging students to persist in the autonomous learning; (iv) providing more ways for them to practice the learned words; (v) integrating the words learned out of class into the classroom; and (vi) regularly evaluating their learning outcomes.

In addition, selecting good resources is important for autonomous vocabulary learning beyond the classroom. This study recommends the following criteria: (i) Canonical: The language use of the materials should be canonical either in written or spoken form; (ii) Popular: The materials from Chinese Web sites should be popular and up to date, and they should have many options such as economy, culture, fashion, and so on; (iii) Interesting: The materials should be interesting to learners so that they can persist for a long time. Zhang (2012) provided some resources of Chinese learning, so learners can refer to them as a guide. Apart from these, learners should find more resources by themselves according to the criteria.

13.8 Evidence of Student Learning

This section presents a brief case study of a student employing the proposed new media to learn Chinese vocabulary beyond the classroom. Frank (pseudonym) is a French student who learns Chinese as a second language in an international school in Beijing. He is a Grade 2 student in the primary school. In class, he has six Chinese language classes per week. He finds his Chinese lessons interesting and likes them very much. Thus, he is eager to know more about Chinese after class. He is a fan of Chinese Kungfu. He watched the video of 'Bruce Lee and Chinese Kungfu' and learned the word 融合 *rónghé* 'integrate' in it by himself following the procedures introduced in this paper. He checked the meaning and use of the word with the help of a dictionary. Afterward, the student was asked to reflect on this learning experience. He indicated that such kind of autonomous learning had positive effects on his learning. He could choose the topics he was interested in and grasp the meaning of the unknown word firmly, as he was willing to know the word for a better understanding of the interesting video.

13.9 Conclusions

Learning vocabulary in class has attracted much attention in CSL. Yet very few studies have suggested how to learn vocabulary beyond the classroom especially through using new media. Compared to the limitation of in-class learning, students

have more flexibility and choices after class. New media, which are ignored as handy tools for language-learning purposes, are ubiquitous, interesting, up-to-date, and especially attractive to users. It is easy for people to have access to one or more of them at any time, in any place. Regarding CSL learners, making good use of them will not only help them enhance their language abilities, but also understand more about the Chinese culture.

The main findings are summarized as follows: First, in comparison with in-class learning, language learning beyond the classroom is more flexible, communicative, interesting, initiative, and has more options. Second, based on the eleven dimensions (location, modality, skill, learning aims, control, type of interaction, language register, logistics, task demands, manner, and resources) put forward by Nunan (2015) and Nunan and Richards (2015), this study compared new media (e-texts, streaming media, and social media) with textbook and found that out-of-class learning is more diverse. Third, this study suggests five Dos and five Don'ts for learners. Fourth, three specific learning plans are elaborated combining the objectives, methods, procedure monitoring, and outcome evaluation. Fifth, autonomous learning is beneficial when combined with the new media. However, the learner's autonomous ability may affect the effectiveness of the learning, and thus teachers' guidance would be of much help. Sixth, autonomous learning can attract students who want to learn more about Chinese after class. This method would be further introduced to more students. In October 2015, the findings of this paper were shared in a session on Scholarship of Learning & Teaching at EdUHK. Many teachers and students attended it, and they were very interested in this way of learning. The findings could have continual influence so long as new media are popular among CSL learners.

This study paves the way for CSL learners to autonomously learn vocabulary beyond the classroom through new media, which can greatly improve their language abilities and learning initiatives. In future work, the ways of learning other Chinese language elements, such as the grammar and sentences, will be examined to better support learners. In addition, the methodology proposed here is also applicable to other languages.

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Chapter 14

Learning the Use of “Irony” from the Perspective of Theory of Literature: A Case Study Using Wang Meng’s *The Stubborn Porridge*

Chi Shing Lai

Abstract Using irony as an example, this study demonstrates how to enhance students’ appreciation of literature through extracurricular reading. We will apply the theories from Wellek and Warren’s *Theory of Literature* to analyze Wang Meng (1934, 王蒙)’s well-known novel *The Stubborn Porridge* (1989, 《坚硬的稀粥》). The use of irony in different aspects of narrative fiction, such as plot, characters, setting, and language control, will be examined. Following the ideas of Scholarship of Teaching and Learning (SoLT), some suggestions are made about using digital media with students to encourage them to enjoy and learn from their reading experience.

Keywords Scholarship of teaching and learning · Irony · Theory of literature · Wang meng · The stubborn porridge

14.1 Introduction

The teaching of reading has always been an important part of post-secondary school language and literature study, and extracurricular reading is also an integral element in the learning process of students. Reading involves considering the meaning of the text and seeking understanding of the author’s intentions. Extensive reading, through extracurricular reading, for example, can greatly aid language learning. It helps students to enhance appreciation of the language and to learn about rhetorical and literary techniques. Irony is one good example of the many literary techniques. It is widely used, and understanding its use can facilitate understanding of literary writing that has used it. However, students always complain about the difficulties that they face in learning about theories of irony; for instance, they cannot

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understand the definition and application of ironic settings, ironic characters, ironic plot, and ironic language control, because irony is when someone says or does something, but means another thing or intends for something else to happen, and it is often defined incorrectly. However, with the help of information from the Internet, such as TV series, movies, and dramas, it becomes more interesting and more accessible and easier for this kind of learning and teaching. In this study, we will apply the theories from Wellek and Warren's *Theory of Literature* to analyze Wang Meng's (1934, 王蒙) well-known novel *The Stubborn Porridge* (1989, 《坚硬的稀粥》) using ideas from the Scholarship of Learning and Teaching (SoLT). The learning and teaching of irony in different aspects of narrative fiction, such as plot, characters, setting, and language control, will be examined.

In this digital technology era, the learning and teaching of irony does not mean only studying printed books, but also reading using electronic media. In 2012, Varsity of The Chinese University of Hong Kong surveyed more than 260 secondary school and university students on their reading habits, finding that in addition to printed books, newspapers, and textbooks, Hong Kong students are likely to read materials in e-books, blogs, and online fiction series and shared articles on social media platforms. Computers and other similar forms of digital technology allow students to continue their studies at home and can be used to provide tutorial assistance for those students who would benefit from it. Digital methodologies are attractive, fashionable, and interesting in students' eyes.

As educators helping students to learn about the use of irony, we need to study the relevant theories of literature, learning and teaching in great depth. *Theory of Literature* (1942) by René Wellek and Austin Warren is a useful book as it encompasses a history of literature, literary criticism, and literary theories. Translated into Chinese in 1984, it has had far-reaching impact in Chinese literature in the last three decades, especially on China's contemporary literature (Cheng, 2009).

Theory of Literature focuses on the nature, function, form, and content of literature; these four elements are important in language education. Sect. 3—The Extrinsic Approach to the Study of Literature—and Sect. 4—The Intrinsic Study of Literature—are two important pillars of the theoretical framework of this book. Wellek and Warren question the Extrinsic Approach which they consider to be only concerned with research into the biographical, social, psychological, and other aspects of a literary piece. They believed that the text's "decisive structure"¹ is the

¹Wellek and Warren thought of literature as a presence, and it is an objective and stable, and readers' experience differ vastly, and therefore, it is relative to different levels of recipients who have some certainty. However, for readers to accept the point of view, the main literary work must explore real experience in order to obtain its real existence. Accordingly, Wellek and Warren's text-centric existence of literary works will be divided into the ontological existence and experience there. There is a body of the text itself the objective existence, there is the experience of the aesthetic text reader who accepted the reality of existence as an object of any art is to accept an ontology exists, it is the text of their own voice, meaning, and the performance of the other things that constitute the aesthetic level. Overall, it determines the existence of fundamental literature; therefore, Wellek and Warren called it 'decisive structure.'

heart of the theoretical basis for analyzing a text and thus focused on “The Intrinsic Study of Literature.”

In this paper, we will apply the theories to study the constituents used by Wang Meng in constructing his famous novel *The Stubborn Porridge*. Our key intention will be how such theories can assist with the teaching of the use of irony. For this purpose, the three constituents will be examined: the plot, characterization, and setting. Also, we will study the language and dialogue control as an additional constituent.

It should be noted that the concern of this paper is the study of “ironic novels.” Many novels use irony, especially in some dialogue and plot development. However, this does not make them ironic novels.

14.2 The Scholarship of Learning and Teaching (SoLT), Development of Irony and Wang Meng’s Novel

The Scholarship of Learning and Teaching (SoLT) is an emerging movement of scholarly thought and action that draws on the reciprocal relationship between teaching and learning at the post-secondary level (Boyer, 1990). An important goal of SoLT is to enhance and augment learning among and between individual learners by investigating the many features of discipline-specific expertise and best pedagogical practice (McKinney, 2007).

Irony is a language device that we can use in spoken or written form. There are two main kinds of irony: The first one is verbal irony which the real meaning is concealed or contradicted by the literal meanings of the words and the second one is dramatic irony when there is an incongruity between what is expected and what occurs. It is derived from the Greek *Eironeia*, meaning “a smooth, low-down way of taking people in” (Muecke, 1970: p. 14).

Irony is widely applied in narrative literature and is considered an important technique. It was the crucial technique Socrates (469 BC—399 BC) used to win his debate. The concept later evolved to “ridicule” and other meanings. Friedrich Schlegel (1772–1829), a German critic and dramatic poet, thought that in irony, “self-creation and self-destruction are often used interchangeably” (Schlegel, 1996: p. 60). Søren Kierkegaard (1813–1855), a nineteenth-century Danish philosopher, considered the “father of existentialism,” wrote in *The Concept of Irony* (1841): “Irony limits, finitizes, and circumscribes and thereby yields truth, actuality, content; it disciplines and punishes and thereby yields balance and consistency” (Kierkegaard, 1989: p. 326). In this, Kierkegaard emphasized that properly used irony concentrates the reader’s mind on the truth of the situation described. It does that by deliberately stating the opposite of the truth intended and so encourages the reader to think more actively about what the truth is. For example, at the very beginning of *The Stubborn Porridge*, there is a sentence that describes the “natural rights” ironically: “Elder Sister Xu, age 59. She had been with us for 40 years, and

we all call her Elder Sister Xu. A clear case of all men born equal with natural rights” (Wang, 1994: p. 8).

From Plato to the eighteenth century rhetoric of irony, and from German Romantic irony to the new criticism, irony has become more prevalent in popular literature.

There are different types of irony. Apart from the verbal irony and dramatic irony mentioned above, other types include Socratic irony and situational irony. From a general perspective, irony has two levels of meaning. Rhetoric refers to rhetorical and structural principles used by the writer the text at a microlevel, while having a macrolevel philosophy. Thus, microirony is a means of language structure and style to convey an effect, and macroirony is a way of thinking about the world. This paper focuses on the use of irony at the microlevel.

In ancient Chinese philosophy, verbal irony was commonly used in the *Analects* (540 BC—400 BC, 《论语》), such as the chapter *Eight Yi Part Three* (《八佾篇第三》) and the chapter *Confucius and his Students Talking about Ambition* (《孔子与弟子言志》) and *Zhuang Zi* (369 BC—286 BC, 《庄子》), such as the chapter *World* (《天地》) and the chapter *Horse's hoof* (《马蹄》). One remarkable example of *Zhuang Zi's* ironic allegories is about Confucius trying to convert Robber Zhi (盗跖) to the path of virtue. In this story, the ferocious Robber Zhi was eating a fresh human liver when Confucius arrived, and Confucius praised his “virtues” (mainly physical). This story satirizes the attempts by Mencius and his ilk to induce rulers to discover their innate goodness. But the term “irony” (反讽—*fǎnfěng*) is a relatively new word in Chinese language. It first appeared in the “New Words/New Meanings” (新词新义—*xīncí/xīnyì*) in the *Modern Chinese Dictionary* (现代汉语词典—*Xiàndài Hànyǔ Cìdiǎn*) in 2002.

After the Cultural Revolution (1966–1976), a large number of ironic novels were published in China, such as Wang Meng's *Story of Captain, Secretary, Wild Cat, and Half Chopsticks* (1978, 王蒙《队长书记野猫和半截筷的故事》), He Liwei's *White Bird* (1984, 何立伟《白色鸟》), Wang Anyi's *Little Bao Village* (1985, 王安忆《小鲍庄》), Wang Shuo's *Half is Fire and Half is Sea Water* (1986, 王朔《一半是火焰一般是海水》), *I am your Daddy* (1991, 王朔《我是你爸爸》), Hong Feng's *Huge Sea* (1988, 洪峰《瀚海》) Liu Zhenyun's *Unit* (1989, 刘震云《单位》), *Husband* (1992, 刘震云《官人》), *Feather Everywhere* (1992, 刘震云《一地鸡毛》), and Ye Zhaoyan's *About the Toilet* (2012, 叶兆言《关于厕所》). Wang Meng's *The Stubborn Porridge* is one of the most outstanding one among these novels.

According to *Encyclopedia of China*, the literary phenomenon from late 1970s to the early 1980s, which occupied a dominant position in the Chinese mainland literary world, is known as the “scar literature.” Scar literature refers to a literary phenomenon which first appeared in China at the end of “Cultural Revolution” (1976). It is the mainstream literary style of that period. The main catalyst was the enormous psychological damage caused by the Cultural Revolution as well as people's reflection on the future of the nation. It was a literary phenomenon emerging at a historical turning point and had a wide impact on Chinese society at

that time (1985, *Encyclopedia of China*). One of the most popular literary techniques used in “scar literature” is irony.

The Stubborn Porridge by Wang Meng is a good example of how these writers used irony. Wang Meng, one of the leading writers in this “scar literature,” used ironic description skillfully (Hu, 2009: pp. 21–22). He was among many Chinese people starting to look for a new road for China after many years of social turmoil. After 4 years of farming life in Beijing rural areas and 15 years of “rural labor reformation” in Xinjiang, he returned to the China Writers Association in Beijing and resumed his writing life in 1978. Undoubtedly, the twists and turns of a tough life gave lots of material to Wang Meng for his writing. He was reinvigorated. With the attitude of ridicule for the new era, he created many unique works.

Many of his novels, such as *The Kite Streamers* (1979, 《风筝飘带》), *A Changing Human Form* (1986, 《活动变人形》), and *The Stubborn Porridge*, were products of his search for a new way of living in China. These books seek to expose the reality of life for Chinese people, not using a direct attack, but using irony, humor, and other creative methods to “understand the world and feelings of humans deeply with an unemotional attitude, and presented us the faults and bad habits among the traditional moral, political system, and humanity indirectly” (Hu, 2009: pp. 21–22). By using “a lot of ironic description in his novel and textual content, so that his text is full of power” (Guo, 2006: p. 20), Wang Meng hoped that the readers could understand the reality that he described in his books.

From 1986–1989, Wang Meng was appointed as the Minister of Cultural Department of The People’s Republic of China, and also with his outstanding works, he had a great impact on China’s literary world. However, there is little research about Wang Meng’s work in the English world, nor in the Chinese one. This paper intends to fill, in a small way, this gap in the literature.

14.3 Constituents of Narrative Fiction

The novel as a literary form is a relatively modern product both in the Eastern culture and Western culture and has been increasingly valued. “The Novel as an art form is, as one can say in German, a form of Dichtung; is, indeed, in its high form, the modern descendant of the epic—with drama, one of the two great forms. The reasons are rather, one thinks, the widespread association of the novel with entertainment, amusement, and escape rather than serious art—the confounding of the great novels, that is, with manufactures made with a narrow aim at the market” (Wellek & Warren, 1963: p. 212).

These authors attached high value to the novel, a stance shared by Liang Qichao (1873–1929, 梁启超). In *Review on The Relationship between the Novels and the Control of the Masses* (1902, 《论小说与群治之关系》), Liang proposed that “today if we want to improve our governance, we should start from the novel Revolution; if we want to refresh our people, we should start to refresh the novels,”

though one focus is on “practical” and one focus is on “art,” but all points to the importance of the novel.

In *Theory of Literature*, Wellek and Warren believe: “analytical criticism of the novel has customarily distinguished three constituents, plot, characterization, and setting; the last, so readily symbolic, becomes, in some modern theories, ‘atmosphere’ or ‘tones’. Each of these elements is a determinant of the others” (Wellek & Warren, 1963: p. 216).

Among these three constituents, plot is the overall storyline of a fiction, ordering the events of a story. “The plot (or narrative structure) is itself composed of smaller narrative structures” (Wellek & Warren, 1963: pp. 216–217).

A character is any person whose existence originates from a fictional work or performance. There are two main types of characterization; they are the direct and indirect ones. Direct characterization occurs inside of the narrative; the author describes the nature and appearance of it directly. In contrast to this, indirect characterization occurs outside of the narrative; the author describes it indirectly by dialogue, comments, and so on. Both of these kinds of characterization are equally important.

Wellek and Warren suggest:

Modes of characterization are many. Older novelists like Scott introduce each of their major persons by a paragraph describing in detail the physical appearance and another analyzing the moral and psychological nature. ... There are static characterizations and dynamic or developmental (Wellek & Warren, 1963: p. 219).

Finally, setting includes the place, time, and background and sometimes includes the weather of the story. Setting is considered the most important of three constituents in “The Nature and Modes of Narrative Fiction”:

Attention to setting—the literary element of description as distinguished from narration—would at first thought seem to differentiate ‘fiction’ from drama; our second thought, however, would rather make it a matter of period ... Romantic description aims at establishing and maintaining a mood: plot and characterization are to be dominated by tone, effect... (Wellek & Warren, 1963: p. 220).

“Its (Novel’s) triumphs have been in the presentation of that psychic life which the theatre can handle but awkwardly. Its essentials are the voluntary absence from the novel of the ‘omniscient novelist’ and, instead, the presence of a controlled ‘point of view’” (Wellek & Warren, 1963: p. 223). These views are expressed through dialogue. “This theory admits of a shift of ‘point of view’ (e.g. from the Prince to the Princess in the second half of *The Golden Bowl*), provided it be systematic. It also admits the author’s use of a character within the novel, not unlike the author, who is either telling the narrative to some friends (Marlow, in Conrad’s *Youth*) or the consciousness through which all is seen (Strether, in *The Ambassadors*)” (Wellek & Warren, 1963: p. 224).

Wellek and Warren also believe “literature must always be interesting; it must always have a structure and an aesthetic purpose, a total coherence and effect. It must, of course, stand in recognizable relation to life, but the relations are very

various: the life can be heightened or burlesqued or antithesized” (Wellek & Warren, 1963: p. 212).

To achieve interesting literature in structural and aesthetic senses, there need to be overall coherence and effectiveness. Burlesque and antithesis, both related to “irony,” can be used to achieve this. “There are two ways of deviating from that mixed mode of epic narration: one, which may be called the romantic-ironic, deliberately magnifies the role of the narrator, delights in violating any possible illusion that this is ‘life’ and not ‘art’, emphasizes the written literary character of the book.... The opposite goal for the novel is the ‘objective’ or ‘dramatic’ method” (Wellek & Warren, 1963: p. 223). Such a “romantic-ironic” style approach is typical in its use of “irony.”

Wellek and Warren’s method for reading and studying novels is applicable to all literary novels and is, therefore, a useful one for exploring “Scar literature” as it enables students to recognize and understand the effectiveness of authors using irony to present their ideas in fictional form.

14.4 Learning and Teaching of Irony in the *Stubborn Porridge*

First, we should teach students the background of ironic novels, perhaps using plays or dramas accessed through the Internet. Teachers and students can work together to discover recent settings of novels and plays that use irony. This will require specific teacher guidance. Then, students are given a couple of specific sites to watch and write about. After that, students can write their discovery about the characteristics of the setting and share them with teachers and classmates on Facebook, blogs, and so on. Finally, teachers and students can take *The Stubborn Porridge* as a model lesson to teach and learn ironic setting, and students can surely understand the application of ironic setting.

Wang Meng used an ironic approach to lay out the setting of *The Stubborn Porridge*, the novel. The thread of *The Stubborn Porridge* is a family’s “meal reformation,” i.e., the setting. Four generations of the family undertook the “meal reformation,” a series of seemingly absurd conflicts and contradictions. Although denied by the author, the novel is widely believed to criticize the political structure and culture in an ironical way.²

The description of the setting is full of ironic writing. It begins with “We lived together, peaceably and united as one” (Wang, 1994: p. 8), seemingly suggesting that the family members appreciate this ultra-stable family order. Then, more details

²Wang Meng, “Saying that bowl—I wrote *Stubborn Porridge*”, *I am Wang Meng* (Beijing: Unity Press, 1996), p. 203. Wang Meng denied that he criticized the political structure and culture. It is believed that it is because he had been sent to the “correction camp” for about 20 years, and the political condition at that time was still unstable. So he just could do his criticizing indirectly.

are revealed: “on all issues big or small, such as whether this summer is hotter than usual, whether to drink Dragon’s Well tea at eight yuan an ounce or green tea at forty fen an ounce, or which brand of soap to use,” until we learn the truth: “grandfather had the last word” (Wang, 1994: p. 8). In this way, the ironic theme is clearly set. When the story links this happy family union with “we even shared the same hairstyle, distinguishing between male and female” (Wang, 1994: p. 8), then the ironic effect is reinforced as. It reminds us that “nationwide blue ants” during the Red Era all had the same hairstyle.

So from the beginning of the story, the author uses irony within the novel’s setting. The meals and reformation linked closely together, as the plot unfolds. The dispute triggered by the reformation will develop and continue as the habit of long historical paternalism and will result in the reformation’s failure again and again. These traditions and customs are “like ‘porridge’, ‘stubborn’, not easy to change. It is just like Sisyphus pushing a stone down a vertex, rolling down like this again and again. Then *The Stubborn Porridge* has the surface meaning and deep significance” (Tong, 2004: p. 125).

We have seen that the family’s “meal reformation” is the setting of this story, and it is just like the reforms that China has had. From the late Qing Dynasty (1840, Opium War—1911, 1911 Revolution) (Zhuo, 2000) to the beginning of China’s reform and opening up in 1978, China has undertaken a series of reforms in science and technology, the political system, and political and cultural thought. Examples include the science and technology reform of the Westernization Movement (1861–1894, 洋务运动), the political system reform of the Hundred Days’ Reform (June 11, 1898–September 21, 1898, 戊戌变法), the 1911 Revolution (1911, 辛亥革命), and the political and cultural thought reform of May Fourth Movement (May 4, 1919, 五四运动). Arguably, these reforms have not succeeded, and China was still very weak and poor. This raises important questions: Was the order of the reforms not right? Or were those reform thoughts from the West insufficiently adapted to the Chinese traditional political culture? Or was the long historical and huge Chinese empire too stubborn? *The Stubborn Porridge* prompts us to think about these issues. Through the above questions, students can not only understand the ironic setting in deep, but also build up their ability in creativity and critical thinking. They can share their thinking to the class by group presentation, and let all classmates learn together.

Second, by the help of Internet, we can also get lots of information about the shaping of characters. For instance, in “Macbeth” by William Shakespeare, Macbeth appears to be loyal to Duncan, but he is planning Duncan’s murder. Duncan does not know Macbeth’s plans, but the audience knows what is going to happen. Teachers and students can integrate them into our curriculum through chat group in Internet. After having the basic understanding of character shaping, we can study *The Stubborn Porridge* which used a great deal of irony in shaping the characters.

As a story, *The Stubborn Porridge* focuses on the stereotype, rather than the pursuit of accurate personalities (He, 2003: p. 467). Various techniques are used to achieve this: Natural fiction and vivid dialogue highlight the characters’ personality;

absurd comic language contrasts each character. Irony is one the key techniques used to shape the characters. Bringing together four generations who come and go and moving from debate to debate, the result was a loyal support of the existing system. In this process, the characters come alive.

In this story, the grandfather cannot said to be too intransigent, as he advocated reform. But he did not change the existing system. The so-called consultation, separation of powers, and democracy are only empty talk as shown by Elder Sister Xu who prayed that this kind of life “would go unchanged from day to day, year to year, generation to generation without end” (Wang, 1994: p. 10). Conversations between family members are full of irony. Mom and Dad’s generation were accustomed to be submissive, just ready to eat meals; brave son who held no regard for reality was doomed to complete failure; returning from overseas, the naive brother-in-law was full of theory, yet his doctrines were dry castles in the air which collapse at the first encounter of any difficulty. The confluence of these characters makes the “porridge” so “stubborn.”

As mentioned above, since the late Qing Dynasty, China has ushered reforms again and again and also revolutions again and again. For 150 years, many new ideas, new thoughts, and new cultures poured into this ancient land: constitutional monarchy, republican system, liberalism, capitalism, Marxism, and so on. However, aside from their enthusiasm, did China’s elites undertake careful deliberation of these ideas? Is China suitable for reform or revolution? Is gradual reform or drastic action more suitable? Like the characters in *The Stubborn Porridge*, different Chinese people had different opinions. Yet, in reality, the road of reforms is immeasurably much tougher than porridge reformation depicted in this novel.

Third, through the Internet, it is very easy for students to find out many examples that use irony in organizing the plot. Such as in Henry’s “Witches’ Loaves,” Miss Meacham had a baker’s shop from which a customer had been buying stale loaves. She thought him to be a poverty-stricken struggling artist and wanted to help him out. One day when he came for his stale loaf, she secretly cut the crust and put in some butter. Students can share their finding in class and discuss with classmates and teachers. Then, teachers can use *The Stubborn Porridge* as an exemplar to help students learn the important element of irony.

Wang Meng uses irony to organize the plot. The novel uses the meal reformation of a four-generation family as the plot, supplemented by a series of reforms which fail. Each reform has auxiliary material which brings subtle irony into the daily lives of ordinary people. The auxiliary material helps promote the development of the overall plot.

The family structure was first introduced: “our whole family, headed by Grandfather and Grandmother, were followers of the maxim that Happiness lies in Contentedness, and were faithful upholders of the existing system of things” (Wang, 1994: p. 10). Given this family order, and because the “new style fashion continues to surge,” Grandfather believed he and his family were reformed, but each “reform” appearing one after another fails one by one through the comments and actions of the members of the family. Each action and comment is shown to be

ironic as each decision made to reform results in the opposite of its supposed intention, i.e., the status quo continues. Reform fails.

The son proposed that for a change, they should have Western food, but Western food proved to be too expensive; many people had indigestion. The family separated into four groups to prepare food, but twelve people had only one stove. As everyone prepared separately on the stove, the gas tank ran empty quickly. Thus, three generations in the family—grandfather, father, and son—concluded that reforms cannot be separated from the material conditions. In this episode, the “wise people” have been mocked by reality, while the person considered to be a “fool,” Elder Sister Xu, was proved to be “the most correct.” The several “reform pioneers,” no matter whether in their joint venture business work, or traveling to a foreign country, finally agreed with Elder Sister Xu that “porridge and pickles” are most important.

At the end of the novel, the author writes “I taped his (The U.K. Ph.D.’s) rhapsody of thin porridge in an impeccable Oxford accent, and played the cassette to my son” (Wang, 1994: p. 38), as the last action in the plot. After all, “Dr. Britain” was the representative of “the best and the truth.” When compared with the true model that Mao Zedong gave to the Chinese people, this plot of the best true model becomes an extreme ironic one. Mao Zedong used Russia as a model for China, and he said, “They (Chinese people) found Marxism-Leninism, the universally applicable truth, and the face of China began to change. ... The salvos of the October Revolution brought us Marxism-Leninism... Follow the path of the Russians—that was their conclusion” (Mao, 1949). This absurd and comical transformation of truth, although beyond the idea of a general sense of right and wrong, reflected the author’s profound experience of political reforms. Wang Meng’s style shows the reader his sophisticated plot through irony. It is the irony that gives his novel its unique charm both ideologically and artistically.

Chinese people have had different kinds of truth during the last 150 years, and these truths and models have been changed many times. Is the truth the real truth? We believe “Practice is the sole criterion for testing truth” (Editorial of *Guangming Daily*, May 11, 1978).

Fourth, language and dialogue are the other important elements in irony skill. If we take some ironic language and dialogue from TV series, dramas, or movies by Internet, for example, the Everyday Verbal Irony, such as “Soft like a brick,” “Hard as putty,” “Clear like dirt,” and “As pleasant as surgery”, then students watch them and try to answer specific questions in chat group, and it would be much easier for students to learn ironic language and dialogue. Finally, teachers can teach ironic language and dialogue through *The Stubborn Porridge*.

Wang Meng used irony to control the language and dialogue. The level of language and dialogue control in *The Stubborn Porridge* is outstanding, and there are a lot of “the obvious warping of a statement by the context we characterize as ‘ironical’” (Brooks, 1991: p. 153).

One good example is son’s hilarious speech at a family meeting: “How shockingly primitive! Porridge and pickles-are perfect symbols of the Sick Man of Asia. This is an insidious form of genocide! A disgrace to our ancestors! This is the

root of the decline of Chinese civilization! ... Would the Japanese Army have dared to incite the September 18 Incident in 1931? Would not their regiments have collapsed in fright if they had seen our lips smeared with butter and our chins dripping with cream” (Wang, 1994: pp. 16–17)?

Finally, his son came to this conclusion: “porridge with pickles is the root of our national disasters, the fundamental reason for the ultrastability of our unchanging feudal system! Down with porridge and pickles! So long as porridge and pickles are not wiped out, there is no hope for China” (Wang, 1994: p. 17)!

So, father, touched, thought: “I deeply felt that heaven and earth should give way to my Son. It could be truly said of him that, nourished on porridge and pickles, he harbored visions of butter and ham. It is no exaggeration to say that he had poured forth the sweeping winds of modernization, enveloping everything within the four dimensions. Truly may it be said, the young are to be feared, the world is theirs. ... I feared the way he had seized on all current abuses with his wit and annihilated everything with a sentence. I feared that this kind of exaggerated rhetoric was just so much air and would end in nothing” (Wang, 1994: pp. 17–18).

Son’s and father’s words use a series of parallel sentences, yet their meanings are totally the opposite. The former was concerned about the country and people. He was impassioned, yet full of clichés. The latter’s speech was almost a joke, but the comments were sharp. The author mixed the use of Tang poems, Chairman Mao quotations, and stories from the *Romance of the Three States* together. The absurdity is thought-provoking and strengthens the ironic effect. He (2003) suggested “The novel is like the monologue comic talk. The author express comical effects again and again by strings popular sentences together, causing readers to laugh uncontrollably” (He, 2003: p. 467).

The language and dialogue are full of irony, and the arguments and debates are the scenes of Chinese history. Since the Chinese modern times, people had already talked about theory, talked about ideals, and talked about the truth too much. We can see the fighting among different kinds of doctrine, a variety of ideological debates, and so on almost every day. We can also see many Marxists who actually ruined Marxism. Leninism and Marxism are different, and Stalinism and Leninism are not exactly the same thing, and because all of the countries’ environment, traditions, and culture are not the same, there is no “one-size-fits-all truth” in the world so. As this study mentioned above, “Practice is the sole criterion for testing truth” (Editorial of *Guangming Daily*, 11 May, 1978). Also, the old saying “empty talk, hard work make the country prosperous,” is an example of traditional Chinese practical rationalism. This road may be the right one that we can go.

14.5 Conclusion

According to the Scholarship of Learning and Teaching (SoLT), students and teachers can stay in touch with the latest research developments in literature skills, such as the use of irony through the Internet as a vital means of teaching and

learning. Then, we can integrate them into the curriculum by lectures and exercises. Teachers can conduct research on students' feedback and use them to guide the curriculum review and improvement. Shulman (1999) argues that scholarship is evident when one's research on learning and teaching is:

1. made public, e.g., through staff seminars;
2. subject to critical review and evaluation by members of one's community, e.g., in peer-reviewed journals; and
3. used developed by and integrated into the activities of one's academic community, e.g., colleagues make changes to their curriculum design or assessment and feedback practices as a result of hearing about your research on learning and teaching.

As an excellent example of the use of irony by gifted authors, *The Stubborn Porridge* can be used by teachers to help enhance students' appreciation of the literature. Computer technology such as online education system can be adopted to encourage and enable students to develop their understanding and learning of irony and its use in the literature through online discussions. In spite of the above learning and teaching activities, teachers can also upload a list of ironic novels and perhaps a second list of those that use some irony to the online education system. Given the preference of many young people for the computer's and mobile's device screen rather than paper, it would be useful if some novels on the list could be accessible online. This would be a way of guiding students to appropriate novels for study. Students can post their writing related to irony on the forum, share with their classmates and friends, and get feedback immediately. Further, an online resource site should be established to present excerpts of novels and questions to guide the readers. This site should also enable online discussions among students and between students and teachers.

This paper suggests that an in-depth grasp of irony in an artistic text can improve students' reading ability and literary appreciation. A detailed analysis on *The Stubborn Porridge* is used to demonstrate how this can be achieved. When reading, we hope to understand not only the surface of the text, but also deeper meaning. From the origin and development point of view, the concept of irony rhetoric has both micro- and macroperspectives—the ironic language and the ironic narrative structure. Analysis from these two layers enhances the understanding of the text from outside to inside and deepens the understanding of the literary piece.

In *The Stubborn Porridge*, Wang Meng has raised important questions about social reality through irony and fun. He used “romantic mocking style,” one form of irony that encourages the readers to think about the funny, ridiculous, absurd, and counterproductive behavior so that we can question our political, social, and cultural reflections.

The power of irony is revealed right from the title. The title uses “stubborn” to describe “porridge,” the former being “hard” and the latter being “soft.” Thus, the title itself exemplifies the rhetoric use of ironic contrast. The novel's attraction does

not depend on flowery language, but also depend on the way ordinary language and dialogue can help us to see more clearly.

Wang Meng has demonstrated throughout the novel his skills in using irony in the setting, performance, characterization, plot, and language control. He used artistic irony through the exquisite, witty language. He has given us a story that combines laughter with tears and thought with tears. In doing so, he has achieved an excellent artistic effect, which can be enjoyed and appreciated by his readers.

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Chapter 15

An Approach to Facilitate Coherent Concept Image Formation via Guided Reinvention

Kell Hiu-Fai Cheng and Siu Cheung Kong

Abstract This chapter presents an approach in mathematical teaching and learning that centers on facilitating student's coherent concept image formation via guided reinvention. The key to forming a coherent concept image lies in the proper understanding of a particular concept. To do this effectively, instead of passively receiving a mathematical notion from a teacher, students take an active role to re-invent the mathematical notion for themselves. There are three general stages in this approach: (1) motivating; (2) investigative and exploring; and (3) reinventing. Three implementations of such an approach are presented in this chapter: (I) areas of closed figures and their formulas; (II) fractions addition and subtraction with different denominators; and (III) the rigorous definition of the limit of a sequence. Details and philosophy of the implementations will be summarized and discussed.

15.1 Introduction

As we strive to improve student learning in Mathematics, we examine various aspects critical to effective learning. Of these aspects, one stands prominently above others: the mental image formation and the understanding of an abstract mathematical notion. The importance of this aspect is well accepted, and in what follows, we present an approach specifically geared for it. This approach is the result of several years of research and experimentations. It embraces the use of digital technology for interactive graphics that enhance mathematical explorations and reinvention.

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Mathematics is a subject of rigor and precision in which concepts and theorems are defined and constructed accurately to provide a solid foundation for the mathematical theory. To many, it is a demanding subject that offers little appeal. This is likely due to the fact that the human brain is not a purely logical entity, and the manner in which it functions is often at odds with the logic of Mathematics. To understand how Mathematics is learned, David Tall and Shlomo Vinner formulate a distinction between the mathematical concepts as formally defined and the cognitive processes by which they are conceived.

A *formal concept definition* (Tall & Vinner, 1981) is a form of words used to specify a particular concept (a mathematical definition or theorem) in a rigorous way, and it is the conventional representation of the concept accepted by the mathematical community at large. As one embarks on the learning adventure of a particular concept, he/she will form a cognitive structure associated with the concept. This structure may comprise of mental pictures and associated properties and processes, and it is referred to as *concept image* (Tall and Vinner, 1981).

For each individual, a formal concept definition generates its own concept image. Such a concept image is a reflection of how the individual understands the definition, and it comprises of pieces of information pertaining to the definition. When one fully understands a certain formal concept definition, he/she will be able draw information from the concept image to articulate the concept in his/her own words and also provide examples to elucidate it. However, as one first learns a new concept, the concept image is often incomplete and incoherent. In many cases, the pieces of information in one's concept image are not a logical or a coherent whole of the intended meaning of the definition. In fact, sometimes they may even be a collection of conflicting pieces of information.

Traditionally, a teacher first presents a formal definition and works on it for a while and then spends time on a series of examples to illustrate the definition. This is a time-honored approach that is effective if the students can remember and absorb everything. However, students in general do not possess such a prowess in mental capacity and, thus, they may only retain fragments of what is taught. This partial understanding of the formal definition is likely the source of distress in Mathematics learning when the fragmented pieces of information are incompatible, or even in conflict, with some previously acquired notions. The major problem here is that the formal definition and its corresponding examples are given to the students, and then, the students have to make sense of them. Making sense of an abstract definition with a few examples could be difficult at times and when they fail to do so, forming a coherent concept image is simply a fantasy.

A solution to the above difficulty is to switch from passive learning to active learning. In Hans Freudenthal's philosophy of Guided Reinvention (Freudenthal, 1991), students are to be guided towards reinventing Mathematics by doing it themselves. They should experience a similar process compared to the process by which the mathematical notion was invented. In other words, instead of giving students a formal concept definition on the outset and then analyzing or demonstrating it afterwards, they should construct an equivalent form of the formal concept definition themselves.

For any mathematical concept, there are critical components that characterize it. Students will investigate and explore these components in turn and then combine these components as a whole to construct a version of the formal definition. There are three general stages in the new approach:

1. Motivating and revisiting prior knowledge;
2. Investigating and exploring the individual critical components/issues in turn; and
3. Reinventing by combining the results in 2 to form a version of the formal definition.

We note that this approach was not always easy to implement in the past as it was often difficult to perform meaningful exploration on paper when the concept involves dynamism of manipulations. With the advance and ubiquity of information technology, computer tools are now very effective for educational purposes. They are immensely useful to students in providing interactions and visualization feedback, which are crucial in the formation of a coherent concept image.

In this article, we present three examples of how the above approach with the help of computer software can be brought to a classroom. These three examples cover topics on area of closed figures, fraction arithmetic, and the rigorous definition of limits. The first two are elementary Mathematics, and the last one is an advanced one. They demonstrate that the approach can work with different levels of Mathematics.

15.2 Three Examples

15.2.1 Areas of Closed Figures

The topic of area of a closed figure is taught at the elementary school level. Students often first start with the area of a square and the area of a rectangle along with their area formulas. Then they move on to areas of other geometric figures, such as parallelograms, triangles, trapeziums, and their area formulas. There are three known types of conceptual difficulties (Kospentaris, Spyrou, & Lappas, 2011; Naidoo & Naidoo, 2007; Yu & Tawfeeq, 2011) in going from rectangular figures to other closed figures.

- (1) *the lack of the concept of area conservation, with a misunderstanding that the area of a figure are not the same before and after dissection;*
- (2) *the failure to identify a base and its corresponding height for area calculation; and*
- (3) *the misconception that only regular closed figures such as squares and rectangles have measurable area and corresponding mathematical formulas for area calculation; while other irregular closed figures have none;*



Fig. 15.1 GeoGebra applet for spatial manipulations

Quite often, learning area formulas of squares and rectangles do not pose much difficulty to students. In fact, all that is required here is the ability to count and multiply integers. However, as the topic advances to figures that require reasoning and spatial manipulations, it becomes challenging to students.

A GeoGebra applet (see Fig. 15.1) is developed to facilitate students' spatial manipulations, and it offers a graphical interface with a dynamic coordinate (Chan, Kong, & Cheng, 2014). The dynamic functions of this applet allow users to manipulate, duplicate, and rotate the geometric objects for a clear visualization of the cognitive processes behind the actions on the geometric objects.

Prior knowledge required here are basic integer arithmetic skills that areas of closed figures are measured in unit squares. With the assumption that students have learned the areas of squares and rectangles and their formulas, three pedagogical stages of learning activities are designed to help students to overcome the three difficulties mentioned above and to construct area formulas of other closed figures.

Stage 1: The objective here is to clarify the concept of area conservation, that is, the area of a figure is the same as the total area of its dissected parts. This is imperative for any further development of the area concept. To lead students along this path, the key is to offer students a chance to see an actual dissection of a figure and to realize that the area is conserved. The GeoGebra applet in Fig. 15.1 handles this nicely by allowing students to move the slider at the top of Fig. 15.1 to relocate the dissected triangle of the given parallelogram in the left-hand side of Fig. 15.1 and reassemble them into a rectangle as shown in the right-hand side of Fig. 15.1. As students are allowed to move the slider back and forth repeatedly and therefore empower them to explore the concept of area conservation with the area of the given parallelogram and that of the reassembled area of the rectangle. Here, students learn and revisit the concept of area conservation through visualizing the cognitive process that after dissection, the original area of parallelogram has the same area as that of the dissected pieces and the reassembled rectangle.

Stage 2: The objective here is to get students to determine the base and the height of a parallelogram and their roles in computing the parallelogram's area. The GeoGebra applet shows a parallelogram and the students are to dissect it vertically along one of the vertices onto a side to get a right angle triangle and a quadrilateral. The most difficult part of identifying the corresponding base of a height of a parallelogram for finding the reassembled rectangle is that when that height falls outside the base of a parallelogram. The graphical support in this learning activity is to let students to explore that every parallelogram has two sets of base and height for area calculation (Chan et al., 2014). When students realize that they cannot find a convenient way to dissect a triangle from a parallelogram and to reassemble it into a rectangle when the heights of the parallelogram fall outside the base of the selected

vertices, they can use the other pair of base and height of the parallelogram to dissect into two triangles and reassemble them into a rectangle. This helps students visualize the underlying process in identifying the height corresponding to the designated base and therefore empower them to induce the relationship between a base and its corresponding height of parallelograms for area calculation.

Stage 3a: Students apply their knowledge of rectangular area to find the area of the parallelogram and arrive at the area formula for parallelograms. Also, as there are different choices of vertices to dissect along, this activity promotes students' realization that every parallelogram has two sets of base and height for area computation.

Stage 3b: Students are to use the dynamic function of figure duplication to duplicate one triangle and one trapezium, and then, use the dynamic function of figure rotation to rotate the duplicated figures for the final display of a parallelogram. Students will then reinvent the formulae in finding the area of irregular closed figures such as triangles and trapeziums and find that irregular closed figures such as triangles and trapeziums have measurable areas just as the regular ones do.

15.2.2 Addition/Subtraction of Fractions

Fraction arithmetic is always an important but difficult topic in elementary education. It is particularly hard for students when it comes to arithmetic with different denominators. In the case of fraction addition and subtraction with different denominators, there are three key core properties (Carraher, 1996; Skemp, 1986) that a student needs to grasp in order to master the arithmetic:

- (1) *the concept of a common denominator,*
- (2) *the knowledge of fraction equivalence, and*
- (3) *the application of prior knowledge of whole number addition/subtraction to adding/subtracting of the fractions.*

A cognitive tool, the Graphical Partitioning Model (GPM) (see Fig. 15.2, Kong & Kwok, 2002), was designed for the learning of arithmetic of fractions (Kong & Kwok, 2003; Kong & Kwok, 2005; Kong, 2008). It offers a graphical representation of a fraction to students and provides an environment for them to generalize fundamental fraction concepts, computation procedures, and problem-solving strategies through partitioning and exploratory activities.

Prior knowledge for learning fraction arithmetic requires basic integer arithmetic skills. The key to learning fraction arithmetic lies in the understanding and utilization of unit fractions. Be it to compare two fractions, to add or subtract two fractions or even to multiply or divide two fractions, it can all be handled in terms of unit fractions. There are four stages that students go through in this approach,

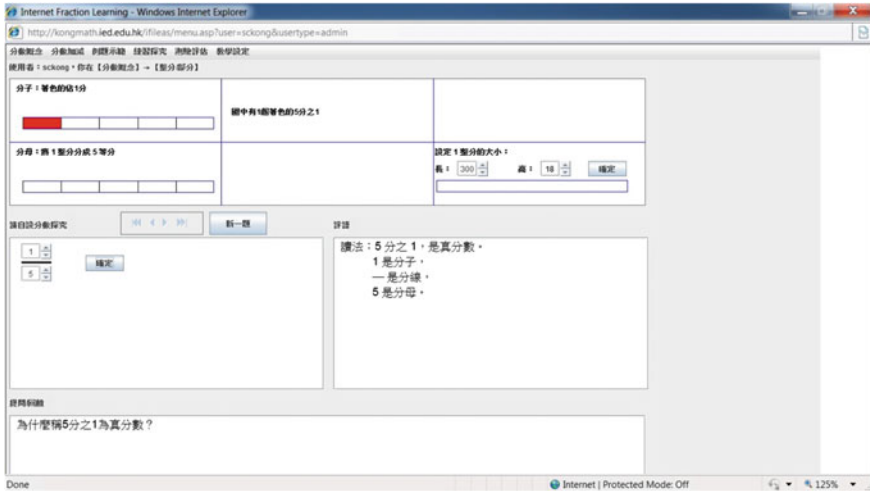


Fig. 15.2 Graphical Partitioning Model (GPM) was designed for the learning of arithmetic of fractions with emphasis on the concept of unit fraction

and every stage builds from the previous work and prepares students for the next stage.

Stage 1: The objective here is to recall and revisit the meaning of unit fractions and the motivation of learning such a concept. This stage starts by introducing unit fraction as the length of an equally partitioned portion of the unit length and denotes such a unit fraction by $1/n$, where n is the number of portions. The exposition here is illustrated graphically by the GPM in Fig. 15.2.

Stage 2a: Students are led to explore and investigate the value of the unit fraction with numerator and denominator multiplied by the same positive integer k . The investigation and exploration will be carried out graphically on the GPM, and they should notice that there is no change in the actual value of the fraction, and this will establish an understanding of fraction equivalence. Investigating graphically with the GPM, they can trace back to Stage 1 that the new fraction is simply a unit fraction with more equally partitioned parts. In other words, if there were originally n portions, then the unit fraction would now represent k of nk portions. Students can easily extend the exploration and investigation of the value of a fraction with numerator and denominator multiplied by the same positive integer k and acquire the general understanding of fraction equivalence.

Stage 2b: This stage works on the addition and subtraction of fractions of the same denominator. It is a natural extension of Stage 1, and students will be guided to focus on applying their knowledge in integer addition and subtraction here.

Stage 3: This is the last stage of the learning process. Students will need to apply what they have learned in the previous two stages here. This stage has two parts.

Stage 3a: This stage works with the sum of two unit fractions of different denominators. The key here is to understand that such a sum is possible only if the

two unit fractions share the same denominator. To do this, exploratory tasks are set up to help students to realize and reinvent that a common multiple is needed here. They are to use the GPM to find the common multiple. With the common multiple found, the two fractions use it as new denominator and the numerator of each fraction simply assumes the value of the other old denominator, which is the equivalent fractions of the old denominators and now shares a common denominator. Now, addition or subtraction of the two fractions can proceed by applying the prior knowledge of integer arithmetic.

Stage 3b: This stage builds upon part (3a) and deals with two fractions of different denominators. As students have learned the work involved dealing with two unit fractions with different denominators, they may take the same procedure to determine the common denominator and just need to find equivalent fractions which share the same denominator. Students then reinvent the procedures of adding/subtracting fractions with different denominators by combining the idea that fractions with different denominators can add/subtract only when there is a common denominator and the results in Stage 2a of finding equivalent fractions and Stage 2b of adding/subtracting fractions with same denominator.

15.2.3 *The Rigorous Definition of the Limit of a Sequence*

The limit concept has always been a difficult topic for upper secondary and university students. The concept of the limit of a sequence has significant impact on other related concepts in advanced mathematics (Tall & Vinner, 1981; Tall, 1992; Roh, 2008; Roh, 2010a). Due to the complex logical structure of the rigorous definition of limit of sequence (Mamona-Downs, 2001; Roh, 2010b; Cory & Garofalo, 2011; Cheng & Leung, 2015), it is not surprising that students often fail to understand the limit concept and they usually resort to rote memorization of the rigorous definition. Formally stated, L is the limit of a sequence $\{a_n\}$ if for any positive real number ε , there exists a natural number N such that for every natural number n greater than N , the absolute distance between a_n and L is less than ε . Symbolically, this is usually written as

$$\forall \varepsilon > 0, \exists N \in \mathbb{N} \text{ such that for } n > N, |a_n - L| < \varepsilon.$$

As in Cheng and Leung (2015), one can break the $\varepsilon - N$ definition down into three critical components:

A. *The geometric meaning of the inequality $|a_n - L| < \varepsilon$*

This inequality is an essential part of the definition that captures the concept of convergence. The other components in the definition are conditions under which this inequality holds. A visualization tool that can lead to the intended definition should graphically represent this inequality in a way such that students can

manipulate it as a dynamic *measuring* tool which can be used to discern the idea of convergence of a sequence.

B. The condition for n to be larger than N ($n > N$)

Students are often confused about what n and N represent, since N does not explicitly enter the inequality and n relates to the part of the sequence that comes after N where N is implicit in the inequality $<$ once an ε is decided. Students should be able to freely manipulate the dynamic measuring tool to find N so that ascertaining the existence condition $\exists N$ becomes a critical visual cognitive activity for students during the exploration process.

C. The dependency between ε and N ($\forall \varepsilon > 0, \exists N$)

The dependency of N on the choice of ε is the most difficult, yet critical, component for students to grasp. The dynamic measuring tool should allow students the flexibility to explore and explain possible dependency relationship between ε and N in the process of reconstructing (or re-inventing) the limit definition. It may be pedagogically more challenging *not to* embed rigidly the intended dependency relationship into the dynamic measuring tool. This will make the exploration more open for critical discernment.

A GeoGebra-based dynamic Applet (see Fig. 15.3, Cheng & Leung, 2015) is specifically designed to help students learn the three components of the rigorous concept of the limit of a sequence.

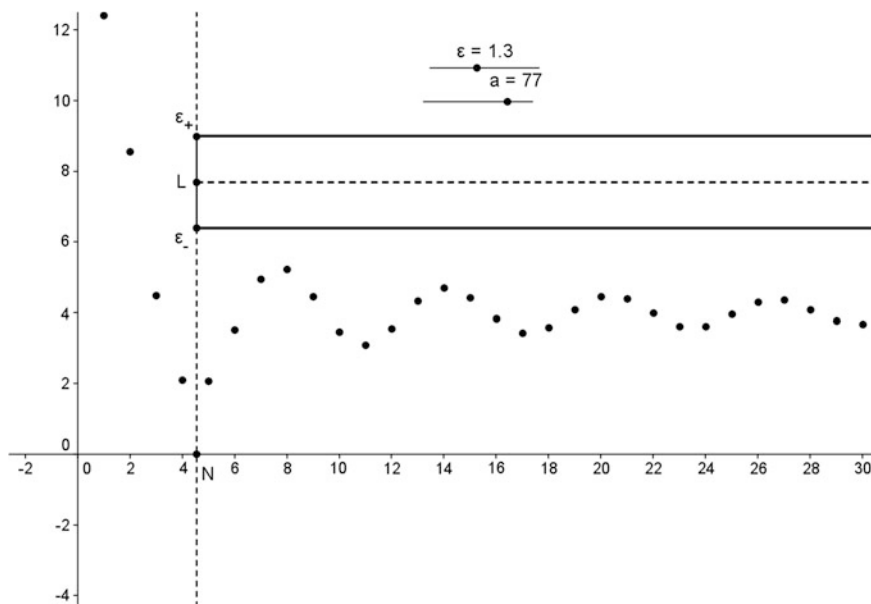


Fig. 15.3 A draggable open-ended rectangular strip—the $\varepsilon - N$ ruler

The figure above depicts a snapshot of the GeoGebra applet for the sequence:

$$a_n = 10((\sin(n))/n) + 4.$$

Prior knowledge required here are that students have an intuitive understanding of the concept of the limit of a sequence from an introductory calculus course. There are three stages of learning activities that students go through here.

Stage 1: A revision of the intuitive understanding of limits is presented and that is followed by a discussion on the need of a rigorous definition of the limit of a sequence.

Stage 2a: Students are given various sequences and are asked to use the applet to plot the sequences and to determine if the sequence tail can be contained in the draggable rectangular strip of given width ε . The sequences given at this stage are fairly simple, and students have likely seen them in previous Mathematics classes. The objective here is to relate what they know of the convergence of sequences to the containment of the sequence tail in the rectangular strip. This rectangular strip is a graphical representation of the inequality of the rigorous definition.

Stage 2b: With the same set of sequences as in Stage 1, students are to realize to role of the anchoring point N (left edge x -value) of the rectangular strip in relation to the value of the running index n of the sequence. The goal here is to establish that $n > N$ and to realize the implicit role of infinity in the definition.

Stage 2c: With the same set of sequences as in Stage 1, students are to explore the dependency of ε and N by exploring the existence of one when the other is given. In convergence cases, the existence of N is achieved for any positive ε . However, this phenomenon does not occur in divergence cases. Students are to record all of their findings and use them in the next stage.

Stage 3: This stage serves as a summary for the students to combine all they have found thus far to form a version of the rigorous definition of sequence convergence. Note that students are not expected to form an exact version of

$$\forall \varepsilon > 0, \exists N \in \mathbb{N} \text{ such that for } n > N, |a_n - L| < \varepsilon$$

Nevertheless, this stage will allow students to associate all they have found and present their findings in one package.

15.3 Key Aspects of the Three Examples

At the first glimpse of the three examples, one may not see much in common among them besides their use of information technology and their approach of learning the material in stages. The keys of the three examples lie in the pedagogical design and its execution.

- (1) It is important to ensure that students have the necessary background or foundation for the material. There is an expectation on prior knowledge, because techniques learned in the past are tools for the present. Students will use these tools to learn new techniques and accumulate their knowledge. In fact, the more emphasis placed on using prior knowledge, the better it will be for the learning outcomes.
- (2) The overall design philosophy is to facilitate a logical build-up of a concept. A concept can be broken down into several pieces of core attributes/components that are logically linked to each other. It is through this logical chain of relationships that students build up a coherent concept image.

I. Area of closed shapes

The objective is to guide students from the areas of square and rectangle to the area of parallelogram and then to the area of triangle and to the areas of other planar figures. Starting from rectangles and with the help of computer graphics, the relation of parallelogram and rectangles can be easily established. Knowing the computation of a parallelogram is the key to finding the area of a triangle as it is simply half of an associated parallelogram. Upon knowing the area of a triangle, one can extend the learning further to other planar figures such as trapezium.

II. Fraction arithmetic

The key to learning fraction arithmetic is unit fractions. A geometric interpretation of unit fractions is graphically presented to students to serve as the motivation of such a concept. It is here that the role and significance of the numerator and the denominator will be explained, and thus, that leads to the conclusion that adding/subtracting of fractions is possible only when the fractions share the same denominator. Then students learn to add and subtract fractions of the same denominator by making use of prior knowledge of integer arithmetic. Also, this leads to the idea of multiplying an integer to the denominator and nominator of a fraction. All this work is complimented with the graphics in the GPM. A more critical step is to investigate the situation in which each divided part of an equally partitioned unit length is to undergo a further partition and that leads to the realization of the proportional increase in the denominator. Next, when it comes to fractions of different denominators, students can appeal to the idea of a proportional increase in denominators to ensure that the two fractions do share a common denominator.

III. The Limit concept

To effectively learn the rigorous concept of limit requires an intuitive knowledge of the convergence of a sequence, which is the prior knowledge here. Students work through exploratory tasks investigating gather information of the three main components of the concept. As the tasks wind down, they make use of the information found earlier to assemble a version of the rigorous definition.

Stage 1: The geometric meaning of the inequality $|a_n - L| < \varepsilon$

Stage 2: The condition for n to be larger than N ($n > N$)

Stage 3: The dependency between ε and N ($\forall \varepsilon > 0, \exists N$)

The underpinning focus of the three examples is help students discover the mathematical notion, be it formulas or abstract mathematical definitions, for themselves. This can be done in three general stages of teaching and learning:

1. motivating and revisiting prior knowledge;
2. investigating and exploring the individual critical components/issues in turn; and
3. re-inventing by combining the results in 2 to form a version of the formal definition.

The teacher first needs to isolate and focus on the critical components of or pedagogical issues associated with the mathematical notion (for Stage 1). The teacher then designs exploratory stages for each component or issues and arranges the exploratory stages in an order that one logically leads to another (for Stage 2). Finally, the last stage will lead the students into re-inventing a version of the mathematical notion for themselves.

15.4 Conclusion

Assuming that students are mathematically prepared for a mathematical concept, that is, they have an adequately grasp of prior knowledge, a traditional lesson starts with motivating examples to draw students' attention and then presents the concept and then perform further illustrations of or investigation on the concept. Quite often, the whole process is done by the teacher while students watch and listen. This is an effective way to tell students what a certain mathematical concept is, but it is less effective in helping students form a coherent concept image.

If we take a flash back at how Mathematics is done through its history, we see that when mathematicians see a mathematical phenomenon or patterns or encounter a problem. They investigate and explore the nature of the problem through a series of mathematical experiments or calculations. As they gain a deeper understanding of the problem, they theorize and construct a proof for it. Of course, there are numerous occasions where a proof is never found or is still being studied. Nevertheless, this is the approach of how Mathematics is created. We advocate to take learning Mathematics along this path as Hans Freudenthal had proposed it to the mathematical community in the past. Some results pertaining to the approach proposed are published, and some are being prepared for publication. Also, this approach has been shared in various professional seminars. With the advancement and ease of use of information technology, mathematical exploration has never been easier, and it is high time take the students on a journey of mathematical discovery.

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Part III

Assessment

Chapter 16

Constructing Formative Assessment Strategies

Bick-Har Lam

Abstract For years, formative assessment has been a popular topic for educational reforms across the globe. This form of assessment demands high level of student participation and teachers' continuous feedback during and after instruction time and is recommended as a useful means of learning for students in both the schools and higher education institutions in the twenty-first century. The current chapter discusses the underpinnings of formative assessment, being a newly promoted assessment concept in the education literature. It explores the main theories in formative assessment and its relationships with student motivation and self-regulated learning. The chapter further discusses exemplar formative feedback practices derived from this body of the literature, and they are research-based practices applicable to different classroom settings. Suggestions are made to recognize formative assessment as an important strategy of reforming education; this echoes the ideas of scholarship of learning and teaching (SoLT) in promoting professional learning for improving student learning.

Keywords Formative assessment · Formative feedback · Motivation · Self-regulation · Confucian heritage culture

16.1 Introduction—The Current Trends of Assessment in Education

This chapter discusses the trends of promoting formative assessment in the education systems over the world, with a special focus on the situation of Hong Kong being a Confucian heritage society, in which its education is often described as examination oriented. It discusses how this new assessment approach serves to benefit student learning, by relating to the theories of motivation and self-regulated

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learning, establishing its roots in the psychology literature. It also includes exemplar practices of practitioners' experimentation of formative assessment in both the school and higher education sector, describing research-based pedagogies and methods that scholar-teachers have put on trial for this newly promoted assessment concept.

Based on both the theoretical and empirical literature, this chapter combines the ideas of classroom-based formative assessment practices with the theoretical construction of such practices, illustrating ways of how scholar-teachers can create scholarship of teaching by implementing innovative practices to improve student learning. Since formative assessment has only been promoted recently and it is a relatively new concept in the education community, extensive practices have yet to be developed and thus a comprehensive review on practice has not been found. If formative assessment is to make influence on learning and teaching, a review of theoretical literature supplement with examples of scholarly/research-based practice may address the issues, and it would stimulate more discussions on the topic and create more research-led teaching practices to benefit student learning. The theoretical framework provided in this chapter can act as a guide to practitioners who are interested in promoting learner-centered pedagogies. It echoes the idea of SoLT as practitioners can reach a high scholarly standard in their practices, by experimenting and innovating practices that are both supported by sound theoretical underpinnings, and exemplars ensure positive outcomes of learning, and the approach of framing a feasible and meaningful study in the area.

This chapter is developed based on the following key questions: What is formative assessment and what are the claims for formative assessment as a trend in education worldwide and in an oriental society such as Hong Kong? What are the exemplar practices of formative assessment derived from this body of the literature? How can formative assessment be implemented in an oriental society such as Hong Kong where examination is seen as a dominant feature?

The word assessment comes from the Latin verb *assidere*, meaning "to sit beside" (Musial, Nieminen, Thomas, & Burke, 2009). It implies the process by which people get together to evaluate the educational experience and the ways to make it more meaningful. Broadly defined, assessment is the process of documenting outcomes, usually in measurable terms, on knowledge, skills, attitudes, and beliefs. Assessment includes summative and formative ones: The former aims at measurable outcomes of achievement, while the latter serves as support to enhance outcomes by offering feedback and as a scaffolding tool to support student learning to seek improvement.

Traditionally, education was characterized as a one-way traffic based solely on the teacher's transmission, where learners passively absorb preprocessed information and then regurgitate it in response to periodic examinations (McCarthy & Anderson, 2000). In the twenty-first century, educational reforms put forward ways of recognizing the learners in the educational process (Henson, 2015; Lam, 2008; Furlong, 2008), by means of shifting the responsibilities of organizing, analyzing, synthesizing, and evaluating content from the teacher alone to the students as well (Lam, 2008, 2011a; Means, 1994). With such noticeable shift in conceptions of

teaching and learning, a relative parallel shift in relation to beliefs about assessment from summative to formative has emerged and even gradually begun to influence worldwide over the past few decades through educational reforms (Carless, 2012; Taras, 2005; Yorke, 2003). Along with the summative function of assessment as a major policy lever for improving education through comparisons among schools against standards (Shavelson et al., 2008), formative assessment has increasingly been viewed as an integral part of teaching and learning process worldwide.

In Hong Kong, a local report entitled “Learning to Learn—The Way Forward in Curriculum Development” (2001) was proposed by the Curriculum Development Council (CDC) to set the key directions for curriculum reform in Hong Kong with the ultimate goal to raise the quality of education and levels of student achievement. In line with the visions and overall aims of education for the twenty-first century worldwide, the Hong Kong school curriculum aimed at the development of higher-order skills and the idea of “learning to learn.” As a reform agenda, “Assessment for Learning” (AfL) was introduced and recommended with great emphasis (CDC, 2001). Along with the traditional culture of formal examinations in Hong Kong as “Assessment of Learning” (AoL), which is to measure how much and how well students have achieved, formative assessment focuses on developing learner’s capabilities of being able to learn independently and developing learners to actively engage in learning. One of the suggestions made by the CDC (2001) stated the values of formative assessment:

Schools and teachers can use feedback (e.g. informal, formal, verbal, written), whenever appropriate, to inform students of their strengths and weaknesses. Students will then be motivated by recognition of their achievements and they will also know what steps they need to take to address their weaknesses (p. 81).

It can be duly observed that the curriculum makers have been making attempts to improve the assessment culture of Hong Kong with the insight that assessment can help to provide information for both students and teachers to improve learning and teaching, to support student learning ultimately (Black & Wiliam, 2009). Formative assessment not only has impacts on school education, the higher education sector also increasingly follows suit (Mok & Cheung, 2011; University Grants Council, 2010). The University Grants Council (2010, p. 83), for instance, has explicitly urged that “institutions and individual academics should take account of this literature (the ones on learner-centered pedagogies) in their curriculum design and faculty development programmes to improve teaching.” In fact, in the educational environment of higher education, attention on feedback was not as great as it was reflected in the school literature. Until recent years, evaluation report of higher education indicated that effectiveness of feedback was one of the least satisfactory aspects of students’ university experiences (see Yang & Carless, 2013; Radloff, 2010).

16.2 Formative Assessment, Self-regulated Learning, and Learning Motivation

When the cook tastes the soup, that's formative; when the guests taste the soup, that's summative (Scriven, 1967, p. 63).

Michael Scriven appeared to be the one who made the very first usage of the term “formative” in relation to curriculum and teaching in an *Evaluation Thesaurus* in 1967 (Black & Wiliam, 2003), to indicate an ongoing refinement process in educational evaluation. By referring to the same spirit as described in this metaphor, formative assessment is used to mean the assessment that is intended to generate feedback on performances to improve and accelerate learning (Sadler, 1998). Above all, for an assessment to be formative rather than summative, it requires additional feedback and a direction of how teachers and students can improve accordingly and, respectively, so as to reach the expected standard by creating an informative and shared assessment community (Lam, 2011b). This coheres with Sadler's (1989) explanation about formative assessment that:

Formative assessment is concerned with how judgements about the quality of student responses (performances, pieces, or works) can be used to shape and improve the students' competence by short-circuiting the randomness and inefficiency of trial-and-error learning (p. 120).

It can be noted that the focus of formative assessment is more on judgements about the quality of student work and then how such assessment judgements may be put to use in bringing about possible improvement in various aspects during the ongoing teaching and learning process. Apart from this, with years of research on the issues of assessment, Black and Wiliam (2009) endeavored to develop the theory of formative assessment. They defined that:

Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that elicited (p. 9).

From this definition, it is clear that formative assessment is devoted to achieve the precise purpose of “regulating learning processes” in order to improve teaching and learning, by making a good use of the evidence or information elicited in the learning and teaching processes. Since the formats of eliciting information and gathering evidence are wide-open to teachers' preferences and pedagogical choices, formative assessment is still open to discussion with numerous possible interpretations. The consensus is that the key of formative assessment is to do with teachers' attempts in eliciting and interpreting evidence for the purpose of enhancing instruction to improve student learning. To be able to achieve this purpose, strategies of carrying out formative assessment are often associated with the literature of motivation as well as self-regulated learning—the former determines a healthy status of accepting assessment information, and the latter supports

learners to manage the way they learn and what they can do more to improve learning as a whole.

Black and Wiliam (2009) suggested that the key of designing formative assessment strategies should be on how successful teachers can activate students as owners of their own learning, which brings in metacognition (Hacker, Dunlosky, & Graesser, 1998), motivation (Ryan & Deci, 2000), and self-regulated learning (Boekaerts, Maes, & Karoly, 2005). This underpinning holds true by referring to what Vygotsky's (1978) dictum suggested from his "Mind in Society" in which he mentioned that cognitive growth is encouraged by creating cognitive conflict:

.....learning which is oriented toward development levels that have already been reached is ineffective from the viewpoint of a child's overall development. It does not aim for a new stage of the developmental process, but rather lags behind this process. The only good learning is that which is in advance of development (p. 82).

In line with the above statement, by utilizing assessment as a platform to challenge learners to reflect on their own thinking, teachers and their peers offer a helping hand to learners in a way that cognitive processes are made overt and explicit, thus making the assessment process and result more readily available for future use. Such emphasis on creating cognitive conflict (instead of simply giving right or wrong answers), and on metacognition that involves learners' reflection on their learning process, was claimed to make clear the essentiality of formative assessment in teaching and learning (Black & Wiliam, 2009). It draws teachers' and educators' attention to identifying the gaps between learners' current learning status and the desired or expected educational goals. As explained by Vygotsky (1978), this gap is referred as the zone of proximal development (ZPD), and learners can reach this zone under the guidance of an adult, or in collaboration with a more expert peer.

Thus, the idea of improving learning through formative assessment depends not only just on teachers but also on the active involvement of learners, often through the forms of self-assessment and peer assessment. As explained by Sadler (2010), formative assessment enables learners to engage into a metacognitive process, with the support by teachers to facilitate goal setting, self-manage one's own learning progress, and provide informed evaluative judgement from time to time. The concept of "self-regulated learning" has gained prominence in the education literature in recent decades. In its broadest sense, it refers to all learning processes in which the learner treats acquisition of knowledge as a systematic and controllable process. According to Pintrich and Zusho (2002):

Self-regulated learning is an active constructive process whereby learners set goals for their learning and monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features of the environment (p. 64).

A self-regulated learner is the one who proactively pursues information he/she needs to enhance his/her learning and take steps to master the learning. Self-regulated learners possess academic skills; hence, they rely on themselves in learning.

According to Zimmerman (2002), self-regulated learners are used to engage in “metacognition,” meaning that they monitor and keep track of how they themselves think and learn and seek to come up with better approaches toward learning. Self-regulated learners show high levels of intrinsic motivation toward their learning, and they are eager learners who kick-start learning on their own and are extraordinarily persistent in their learning. Self-regulated learners demonstrate high levels of self-efficacy in learning (Labuhn, Zimmerman, & Hasselhorn, 2010), believing that they are capable of success and independent in their initiatives to learn (Pajares, 2002; Stoeger & Ziegler, 2008). They think of their success in learning as caused by their own efforts and competence (Cantor, 1990; Zimmerman, 2002). In fact, as learners, school students are engaged in a challenging process of acquiring knowledge from the unknown to the level of mastery. In order to learn more and better, students should be trained to be self-regulated in learning. Self-regulation refers to the mental abilities and skills which can be shown in cycles of reflection on learning, monitor of known knowledge, and consideration of future action plan (Zimmerman, 2002). The focus of education nowadays is placed on boosting learners’ self-regulated learning strategies and their intrapersonal intelligence, which aims to develop students as self regulated learners who are also lifelong learners who keep learning in their lifetime.

It should be particularly noted that feedback practices, no matter elicited by teachers or peers, in verbal, written, or other forms, founded steadily the prime core of formative assessment. In practicing formative assessment, learners are given room to digest the feedback received from the others, doing self-assessment and evaluating their performance. This process demonstrates a self-regulating process of learning, in which learners are actively regulating internally their thinking, motivation, and behavior:

Self-regulation can be defined as a multi-component, multi-level, iterative, and self-steering process that targets one’s own cognitions and feelings, actions, as well as features of the environment for modulation in the service of one’s goals (Boekaerts, Maes, & Karoly, 2005, p. 250).

The monitoring of feedback in the learning process can successfully drive learning (Nicol & Macfarlane-Dick, 2006). Empirical studies also show a positive relationship between formative assessment and student motivation (Brookhart, 1997; Black & Wiliam, 1998). Motivations refer to the drive of a person in pursuing their intended goals, and it determines the willingness and effort of taking initiative to learn and the emotional engagement in a particular task (Ryan & Deci, 2000). Motivation can also be divided into two types: being intrinsically motivated means that the person is committed to the goal because of the inherent pleasure associated with the pursuit itself versus a person extrinsically motivated in working on a task who may not develop strong interest in the matter. Brookhart (1997) stated in her study that the feedback information which students can use to make themselves more competent is attributed to the effect of being more intrinsically motivated. Moreover, Cauley and McMillan (2010) explained that if provided with a supportive and trusting environment in which formative assessment is practiced,

positive effect on motivation and learning can be achieved. A classroom where formative assessment is implemented can be characterized as informal, spontaneous and engaging; by which learners' intrinsic motivation can be developed.

Based on a sample of 558 students from the Dutch secondary vocational schools, Pat-El, Tillema, and van Koppen (2012) found that formative feedback (in modes of monitoring and scaffolding) worked positively among the different ethnic student groups in promoting their intrinsic motivation. Noticeable observation showed that students valued the teacher's proximity as this had helped them accept the feedback received in the classroom. Another action research was implemented in a level-three, compulsory module in the program *Health Studies and Nursing* for the degree of Bachelor of Science, at the University of Sunderland (Cooper, 2000). Among the 61 part-time students, it was reported that students were initially unmotivated in studying the courses, and they felt unsure about the formative feedback they received on their assignment draft. In their second or later attempts of reworking on their assignment, students expressed more positive attitudes to formative feedback as "the feedback was explicitly identified as assisting development" and the students described themselves as "adopting a more objective approach to their own work" (p. 284). The changes had brought about a new kind of learning experience in the course for the students. Another study by Hwang and Chang (2011) reported the adoption of mobile learning to introduce interactive feedback between teacher and students could stimulate self-regulated learning among university students, concluding with a fruitful result that "the approach has provided a more challenging learning environment that encourages students to solve the problems on their own" (p. 1031). Such formative assessment strategy was identified as effective in helping students attain better academic achievement.

The empirical literature provides evidences to the proposition that feedback elicited through formative assessment strategies can regulate the learning process for learners and to effect changes on one's motivational belief. The aforementioned examples suggest that viewing the process of formative assessment as solely a cognitive process (i.e., with the involvement of transferring and receipt of information for future improvement) would definitely underestimate, if not ignore the educational benefits that formative assessment carries. The work by Dweck (2000) gives proof to the way that feedback can foster student engagement in learning because of the increased interest. To make feedback a positive learning experience for learners, formative assessment in teaching can be regarded as the key to educational improvement. Contrarily, obsessive summative assessment was found to have lowered learners' motivation to learn with research evidences provided. According to Harlen and Deakin Crick (2003), summative assessment drew learners' attention to focus narrowly on performance outcomes instead of the learning processes. Brookhart (1997) identified that formative assessment worked well in both classroom and large-scale assessments.

16.3 Principles of Formative Assessment Practice

Carless (2012) believes that “good teaching and formative assessment are directly linked” (p. 7). As the value and benefit of formative assessment were recognized by empirical studies, the methodologies, strategies, and tools of how it can be used determine its effectiveness. This section attempts to provide the guidelines in planning formative assessment by citing representative authors in this field of study.

Black and William (2009) suggested five types of activities which can be based upon for carrying out formative assessment. They were generated from the empirical experience of in-service teachers:

- Sharing success criteria with learners
- Classroom questioning
- Comment-only marking
- Peer- and self-assessment
- Formative use of summative tests

In addition to the above formative assessment strategies, Carless (2012) has recently constructed a composite of formative assessment strategies. They include the following:

- Sharing learning intentions and success criteria
- Questioning as the means of engineering productive classroom discussions and dialogues
- Peer learning and assessment activating students as learning resources for each other
- Self-assessment involving students in monitoring the quality of their work
- Extensions of Strategies 3 and 4, which involve students in taking ownership of their learning through learning to learn
- Feedback that helps move learning forward
- The formative use of tests designed principally for summative purposes

Carless (2012) also explained that “each of the strategies involves the elicitation of evidence which is used by students, peers or teachers to inform the learning process” (p. 8). The sharing of various important messages to learners was suggested by Black and William (2009) and Carless (2012) with very similar wordings, if not exactly the same. They emphasized that students have to be informed of their performance so as to be aware of what they are trying to learn. Such importance was highlighted by Clarke (1998):

Without the “secret” knowledge of the learning intention, ...children have been deprived of information that will not only enable them to carry out the task more effectively, they have also been denied the opportunity to self-evaluate, communicate this to the teacher, set targets for themselves and get to understand their own learning needs; in other words, to think intelligently about their own learning (p. 47).

This knowledge or information to be provided to learners is in line with the prime focus of formative assessment, addressing the importance of students’

acknowledgement of the expected learning standards, for which they will aim at and acquire, through interaction between both teachers and learners as the means.

Another most commonly applied strategy of formative assessment is the use of questioning. The key purpose of asking questions, as stated by Black and Wiliam (2004), is to collect information that is useful to the teacher or to raise issues that the students need to think about. The questioning strategies that work as formative assessment are typically the open-ended, higher-order questions (Hodgen & Webb, 2008). It is believed that these types of questions can create a dialogue that includes feedback from both the teacher and students. To be involved in a question-and-answer flow of dialogue, students can articulate what they know during the learning process and thus can help elicit a broader and further range of thinking in a cycle of ongoing learning.

Apart from this, self-assessment and peer assessment are recommended as the key formative assessment strategies conducted by students. Comments or feedback from peers provides insights that help learners to raise internal awareness of the performances of their own work, driving learners to become sensitized to the expected standards in learning. Self-assessment, in Sadler's (1989) classic phrase, is "the possession of evaluative expertise as a necessary (but not sufficient) condition for improvement" (p. 138). Accordingly, as concluded by Black and Wiliam (1998), opportunities for learners to express their understanding will need to be maintained in the teaching and learning processes and that peer- or self-assessment activities can be designed to play such a role.

Feedback elicited from assessment is critical as it challenges learners to take note of the gap between their current works and the required standards. Thus, it was included by Carless (2012) as a distinct property for formative assessment. The essentiality of feedback was highlighted by Rolfe and McPherson (1995), stating that if used appropriately, feedback can motivate learners and redirect their learning toward the area of deficiency and can help teachers improve their coursework and instructional method. Tracing back to even earlier work by Sadler (1989), feedback in formative assessment had been conceptualized as having three components: (a) an understanding of the standard being aimed for, (b) comparing the standard with the current level of performance, and (c) taking appropriate action to close the gap between a and b. To put it more succinctly, it prompts learners to think about: Where am I going? How am I going? Where to go next? After all, if successful feedback practice is integrated into regular classroom environment, learner's reflection, evaluation, and redirection would be elicited, as Black and Wiliam (2003) concluded "good feedback causes thinking" (p. 631).

Another strategy that is commonly adopted by teachers is the idea of formative use of summative tests. In fact, teachers and students need to encounter both summative assessment and formative assessment in the real setting of the school curriculum. On that account, using summative assessment formatively by introducing series of short "tests" may work well in order to move student learning forward in smaller steps (instead of taking place only at the end of school term). Carless (2012) claimed that such strategy has potential to "create positive synergies between summative and formative assessment; and it has potential to carry traction

with teachers in test-dominated settings” (p. 11) as Carless (2012) argued that summative assessment and formative assessment are interlinked and that teachers need to find innovative ways of making them coexist so that they can support ongoing student learning to suit the environment of their unique classrooms. However, teacher should carefully consider about the setting of conducting the formative assessment tasks, as high frequency of tasks carried out in a competitive environment may evoke stress among students.

16.4 Research-Based Formative Assessment Strategies

The empirical literature on formative assessment is still at its infancy in the literature compared with its theoretical conceptualization as well as other dominant forms of assessment such as summative assessment approaches. In this session, formative assessment practices are discussed, and these research-based practices can illustrate the theories we introduced above.

16.4.1 *In-Progress Feedback to Students on Assignments*

Using writing intervention in a first-year undergraduate program, Wingate (2010) found that formative assessment on students’ drafts-in-progress can improve student learning outcomes. It was observed that students who can utilize the feedback they had received did improve in the areas on which critical comments were received and that they did not make the same mistakes in that piece of assignment. According to Juwah et al. (2004), submitting drafts enables learners to acquire better results and makes them engaged in studying the course. In a quantity surveying course, teachers created opportunities for learners to receive feedback on the draft pieces at any time during the learning process in the course period. By giving learners timely advice, learners sought tutors’ comment actively and they self-corrected their own work (Juwah et al., 2004) by considering tutor’s comment. Comparing with the ordinary practice of receiving a final grade, learners were encouraged to learn through the assessment process in this study. They come to realize that they can make improvement to their own study through the uptake of feedback.

In the case of Lam (2011a–c), specific feedback strategies were introduced to students. By involving students in dialogues of discussing their project in groups, students who studied in the Teacher Education programs often received prompts from the teacher, e.g., “as you state thathow did you arrive to this conjecture?”. Summarizing the overall feedback she had given to students, Lam (2011a–c) did intentionally consolidate the common problems encountered by students in a whole class session; by doing so, students were able to learn from others’ problems and the skills of solving a specific issue, and they also learned to troubleshoot and

produce higher quality coursework. This process can, at the same time, help teachers understand students' abilities so that they can provide effective instructions that cater to the needs of students.

16.4.2 Criteria Instrument as a Feedback Tool

Juwah et al. (2004) described how teachers can train students to self-assess their own learning upon the intended learning outcomes of a course. By providing a criteria sheet which tells about the levels of expected learning outcomes of an accounting course, students were required to submit their assignment to an e-platform. In responding to students' work, teachers specified the grades to students (e.g., grade 6 was outstanding, and grade 5 was a very good grade) and she also marked each piece of students' work against the criteria sheet and offered tailor-made feedback to students whenever a point of clarification was necessary. The feedback and grade were e-mailed to students, with an agreed understanding that the grade given was provisional. Students were encouraged to read teachers' comment against the marking criteria, and they were encouraged to respond to teachers' feedback via e-mail to continue the learning loop even when the results were being received. This helps them to do better in the subsequent assignments.

16.4.3 Ongoing Instructional Support and Diagnosis of Learning Needs

In Western countries, formative feedback has been widely experimented in schools. Deirdra Grode, a primary teacher, had faced the problems with students' low scores in examinations (Buczynski, 2009). Deirdra discovered that some students were unable to follow teachers' instruction and had difficulties in moving themselves to study on the next more challenging topic, as they experienced hardships in mastering knowledge of the subject matter. Many students were unable to make improvement and that they were upset.

Utilizing from the literature on the strength of formative assessment, Deirdra continuously assessed students' learning performances by collecting information on students' strengths and weaknesses to keep track of students' individual progress and their learning profile. She was able to evaluate on the learning difficulties encountered by students and offered specific help to cater for individual differences. For instance, she retaught a topic to the low-achieving students in small group and individual consultation based on the diagnostic results of students' work. She also modified her classroom language such as speaking in more elaborated terms and giving authentic examples. Through identifying learners' problems and offering remedial instructions persistently, she was able to narrow the gap between students'

actual learning and desired learning. The wide range of creative formative strategies was also successful in motivating students to learn and improving their learning outcomes.

16.4.4 Project Learning as Formative Assessment

Weurlander, Söderberg, Scheja, Hult, and Wernerson (2012) conducted an action research to explore students' experiences of different methods of formative assessments within the same course. The findings showed that formative assessment influenced students' motivation to learn and made them aware of what they had learned. In other words, formative assessment can influence both the process and outcomes of learning. This idea has formulated the argument of setting formative assessment tasks in a project learning context as it can maximize the benefits.

As reported by Carless (2005), Sue Wong, a preservice primary school teacher, had applied formative assessment in teaching mathematics to primary six school students, in teaching "categorization skills." She introduced a miniproject as coursework to engage students in completing a succession of cooperative learning tasks. Wong had provided students with a feedback sheet, informing the strengths and weaknesses of their performance against a set of predefined assessment criteria. Students were given opportunities to make corrections and resubmit their work to the teacher for consolidating their own work.

Another example was the extensive use of formative assessment strategies in the design of project learning for teaching English composition for primary two students (Lam, 2011b). Miss Pang built series of activities into a project around the theme "endangered animal." First, students were told a real story about the dodos of Mauritius, for reasons that these birds became endangered because they were caught for food by Europeans who migrated and settled in Mauritius. This leads to an exploratory stage in which students learned some other endangered animals through doing worksheets and exercises, and they were also provided with Web sites where they could navigate information about endangered animals. As students were guided to learn through a series of project learning tasks, they acquired useful research skills which can help them investigate into an endangered animal of their own choice.

They were involved in group discussions and individual comprehension tasks and were also taught to use mind-map and tabulated text structure to organize information in a standard structure to proceed with writing about the details of the animal they selected. At the end, students had to complete writing a short composition on a selected endangered animal based on a set of requirement in the forms of a guideline. The project learning exercises were marked by teachers and then returned to students timely at different stages during the course of learning in the project. The end-of-project task was peer- and self-assessed upon a rubric which was a simplified version of the teacher's marking scheme. Each student in the class was required to make a presentation of two minutes to introduce one's own

endangered animal to the whole class, while their self-assessment report was submitted to the teacher together with their written composition. A booklet was used through the project study period, and it comprises the evidence of learning for students as a reflective learning record. The exercises in the project have served as an important form of learning for students. The continuous feedback from teachers and peer was enabled through the formative exercises introduced by the teachers in class. The formative feedback given to students ensure that their learning problems can be diagnosed, and the requirement to follow up the comments gained in the learning process help students to self-regulate their learning, this eventually helps students to make advancement in their project.

Miss Pang's design of a full range of formative assessment tasks in the project has proved to be very effective as a school-based project. At the university level, Orsmond, Reiling, and Reiling (2002) also paired first-year undergraduate biology students in a poster assignment and conducted self- and peer assessment. The contents of the assignment were scheduled to be completed in several stages: Students were involved in various stages of peer assessment exercise, and at the same time that they were allowed to make self corrections before submitting the final assignment. The formative assessment strategies used by the teacher suggested some very positive results, notably on students. They suggested that they learned from the peer-reviewed comments of their peers, and found peer support a valuable experience in the course.

As a whole, one cannot learn to orchestrate formative assessment by only learning the format. The practice of formative assessment implicates the demand of the professional knowledge of curriculum design and learner-centered teaching methods of teachers, who are able to pay attention to the all-round development of individuals, so that they can provide an environment to support the development of problem-solving skills and other traits that support students to be competent learners in the twenty-first century. They must be teachers who are sensitive to learners' needs and interests, those who are genuinely interested in learners and care about their well-being. As mentioned in the cases, Deirdra continuously assessed students' learning performances to discover students' strengths and weaknesses, and she cared about learner diversity, paying extra efforts to make the learning of low achievers possible by addressing their needs. Miss Wong and Miss Pang took the challenges by designing formative feedback strategies to develop students' cognitive strategies, and they adopted useful scaffolding activities which were interesting and fun to do for learners, leaving ample space for learners to maximize their potentialities. During the course of learning, students were exposed to an environment where support (via formative assessment strategies) was available, including frequent verbal and written feedback, from both the peers and teacher. These episodes also illustrate the fact that teachers who carried out formative assessment have actually had a high expectation on learners, and they devoted quality time to help them achieve it. The effect was that students not only achieved more favorable academic outcomes, their capabilities for learning were also enhanced. These substantial learning journeys demonstrate a coregulating process of learning for both teachers and learners (Butler, Schnellert, & Cartier, 2013).

16.5 The Way Forward

Nowadays, the global market emphasizes all-round talents. Traditional summative assessment places heavy emphasis on the achievement in academic performance, and it creates an unfavorable environment for students in developing themselves, resulting in incompetence and handicaps that deter proper development for youngsters in the pursuit of knowledge, personal interest, life goals, and the status of well-being (Lam, 2008; Pong & Chow, 2002). In this regard, formative assessment which promotes intrinsic motivation, metacognition, and self-regulated learning can be utilized as a meaningful pedagogical tool for teachers to re-establish the core value of education in helping learners to realize themselves through developing their talents, interests, and capabilities. The ultimate goal of formative assessment, same as the core aim of education, is to engage students in pursuing their own interest in study. In addition to enhancing one's study skills and achievement, it acts to make every student a resource of learning and strengthen the social support network of learning. By implementing formative assessment, individuals can benefit from their study in educationally meaningful ways. In fact, by involving themselves actively in giving comments to their peers and taking their peers' comments in improving their own work; students can be developed an attitude of seeking improvement and improved the working skills involved in this interaction; all of these are valuable to young people in the twenty-first century to fit the global market.

Teachers in Hong Kong may not be proactive to take a step forward in promoting formative assessment because of the practical constraints; some may hold the view that learners are shaped by numerous examinations, and hence, improvement occurs (Lam, 2011a–c; Dahlin & Watkins, 2000; Cheng, 1999). As a result, authentic research on assessment practice is in demand to provide the proof to those teachers in order to convince them to change their assessment approaches. With the idea of promoting independent learning, generic skills, and lifelong learning attitude as appeared in the curriculum policies worldwide, policy makers should continue to create opportunities of collaboration with educational developers to publicize the benefits of formative assessment, especially attending to cultivate the mind-sets of parents, teachers, principals, or even preservice teachers, and those who only see education as a technical one-size-fit-all training business. During Carless' research (2005), it was observed that “the teachers seemed to go through the stages of developing an understanding of assessment for learning, reconciling it with their prior beliefs and practices, experimenting with and reflecting on the new assessment practices” (p. 49) under the professional support of and collaboration with the research team. Sufficient resources are also essential to support the running of productive formative assessment. Formative assessment demands time of teachers in designing meaningful assessment practices and time of both teachers and students engaging into feedback and reflection.

Noteworthy that government or institutional policy has a significant impact on the implementation of formative assessment. A way to improve learners' personal development would be following the recommendation of formative assessment, i.e.,

“learning to learn” (Curriculum Development Council, 2001) to “reduce excessive tests, examinations and dictations” (p. iv) and “help to provide information for both students and teachers to improve learning and adjust teaching” (p. viii). Design of traditional examinations, which aims to gauge out learners’ memorization, should be changed to accommodate the cultivation of a variety of generic skills development, such as higher-order thinking (e.g., critical thinking and creative thinking) that supports learners to build up the capacities of becoming independent, lifelong learners. Changes in the format of examination is obligatory as the twenty-first century requires multiple talents, higher-order thinking, application of knowledge, and creative problem solving. Reducing obsessive examination gives extra time for learners to learn with self-regulation during class and spare more room for teachers to prepare a class that guides students to be independent learner.

Specific to learners, formative assessment which demands cognitive skills such as listening, recalling, and comprehending, collaboration, and interaction may fit well into the characteristics of Chinese learners who display these qualities (Grimshawa, 2007; Dahlin & Watkins, 2000). Several studies on the cognitive strategies of Chinese learners reported that criticisms on the passivity and rote-learning model of Chinese learners should be reinterpreted. Grimshawa (2007), after reviewing the related literature over the past 10–20 years, argues that Chinese learners’ cognitive-centered, listening-based approach can lead to as active engagement in learning as the more verbal approaches of Western students. Also, Leung, Ginns, and Kember’s (2008) study showed that viewing Chinese students as rote and superficial learners is a misconception. They found that Chinese students displayed a range of intermediate approaches that combined surface and deep learning—that is, they used both memorization *and* understanding—in a similar way to the Australian learners in their sample. Dahlin and Watkins (2000) found that repetition in the process of memorizing can play an important role in improving understanding. Nevertheless, passive and rote learning may dominate if teachers want to “fast-track” in an examination-oriented culture by disabling the expression of diverse viewpoints and creative thinking. Learners who receive formative assessment may need room to develop the knowledge to decode, translate, and hence cope with the feedback from teachers and peers, so that they can evaluate and select appropriate new strategies to raise their performances as they get closer to the goals or standards.

The productive implementation of formative assessment should be a long-term commitment for teachers that should not be expected to succeed in a glimpse of an eye. To promote SoLT, efforts committed to teaching innovations as well as the continued professional sharing among practitioners should be widely promoted in the education community. Hopefully that more teachers can gain the insights of using formative assessment in teaching, as the reward is undoubtedly worthy of the efforts made in improving students’ learning.

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Chapter 17

Formative Feedback as a Global Facilitator: Impact on Intrinsic and Extrinsic Motivation and Positive Affect

Bick-Har Lam, Rebecca Wing-yi Cheng and Min Yang

Abstract This chapter seeks to examine how formative feedback shapes students' motivation and positive emotions in the higher education setting. We propose that formative feedback has a central role to play in fostering students' motivation toward their learning, in that it does not only directly impact their motivation toward the courses where formative feedback practices are present, but also foster their overall motivational tendencies, through the promotion of positive emotions. Looking at a formative feedback project in a HK higher education institution, the current chapter reports a quasi-experiment to investigate the impacts of theoretically derived formative feedback practices on students' extrinsic and intrinsic motivation and their positive emotions experienced during the courses in which the practices were put forth. The research's findings suggested that formative feedback leads to increases in intrinsic motivation to attend the courses and students' overall positive emotions. It also exerts a 'protecting' effect on their extrinsic motivation to attend the courses. Implications of these results are discussed. The impact of this study, especially on its contribution to scholarship of learning and teaching (SoLT), is discussed.

Keywords Formative feedback · Motivation · Positive affect · Self-determination theory

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17.1 Introduction

This article serves to evaluate the effectiveness of a set of empirically derived formative feedback practices. These practices were put forward in the teacher education courses offered by an academic department of a higher education institution in Hong Kong. The findings are discussed and serve to expand upon the previous research in the area. This chapter as a whole demonstrates the attempts of academics in university in Hong Kong in carrying out a new approach of assessment through systematic research-based practices, the cornerstone of this teaching innovation draws particular attention on studying student learning outcomes and a research-led teaching design, and it can serve as an exemplar of promoting the scholarship of learning and teaching (SoLT).

17.1.1 Learner-Centered Pedagogies in Higher Education

The study of formative feedback practices in this article is backed by the rising attention to the issue of learner-centered pedagogies, which has grown highly popular in the education sectors and advocated by various reform agendas across the world (Assessment Action Group, 2002–2008; Mok & Cheung, 2011; University Grant Council, 2010). Weimer (2002) defined learner-centered classrooms as the ones where the teachers, rather than being a transmitter of knowledge and information, act as guides who inform the learners about their progress in the learning processes while offering explanations and encouragement. The key goal of formative feedback is to transform students from passive recipients of information to active participants who independently lead their own learning, through techniques like scaffolding.

There has been heated discussion of learner-centered pedagogies in the education system of Hong Kong (e.g., Yeung, 2009) and they have been being widely promoted in primary and secondary education sectors since the early 2000s (Curriculum Development Council, 1999, 2001, 2002). With this, the Hong Kong higher education sector increasingly follows suit. The University Grant Council (2010), for instance, explicitly urged: ‘institutions and individual academics should take account of this literature (the ones on learner-centered pedagogies) in their curriculum design and faculty development programs to improve teaching.’ Despite this, there has been little literature which addresses how to adopt learner-centered pedagogies in the higher education setting of Hong Kong.

The current study seeks to examine formative feedback strategies, measures widely used to promote learner-centered pedagogies (Clark, 2012). It is a set of teaching methods which emphasizes giving feedback to students on specific parts of their learning processes. This is thought to foster the internal states (such as self-efficacy and interests) that are needed for the self-regulation of learning (Abrams, 2007; Shepard, 2000). By enhancing the self-regulation of students,

these methods are thought to prompt them to become more actively engaged in their studies (Clark, 2012; Shute, 2008).

17.1.2 Formative Feedback Practices in Higher Education

Shute (2008) defined ‘formative feedback’ as ‘information the instructor provides to the learners related to their cognitive process and/or behaviors, with the intention to modify these processes in order to enhance learning.’ It is frequently contrasted with ‘summative feedback,’ the assessment of learning conducted at particular points of time (Taras, 2005). Standardized tests and examinations are the prime examples of summative feedback. In contrast, to give formative feedback, teachers serve as guides who continuously inform students about their thinking and learning. Black and William (2009) stated that formative feedback is to render the implicit aspects of learning ‘transparent’ and ‘explicit,’ hence available for students to use. It involves students deeply in metacognitive strategies, such as goal setting and self-reflection. This in turn is thought to give students a sense of ownership in the instructional activities and thus fosters their active engagement (Cauley & McMillan, 2010).

In the extant literature, formative feedback has been applied to higher education settings considerably (Nicol & MacFarlane-Dick, 2006). One stream of research (Black & William, 2009) focuses on how formative feedback turns learning into a series of moments where the students are prompted to engage in metacognition. It is an approach of ‘reflection-in-action,’ where the students are thought to reflect upon and reshape their own work, while performing the learning tasks under formative feedback (e.g., Kuiper & Pesut, 2004). Black and William (2009), for example, formed a framework that sees formative feedback as primarily a cyclical process of clarifying learning intentions, engineering learning activities, providing feedback on progress, and activating students as owners of their own learning.

Another camp (e.g., Nicol & MacFarlane-Dick, 2006) examines how formative feedback empowers students for self-regulated learning. These scholars emphasize the ways in which formative feedback motivates students by providing them with information on *how* to reduce their distance from their personal learning goals (e.g., Hattie & Temperley, 2007). They argue that the main benefits of formative feedback stem from its scaffolding of further inquiry that deepens cognitive processing, which in turn leads to the students’ motivation to close the gap between their current levels and the desired goals, a task that shallow feedback such as ‘work harder’ cannot accomplish (Vygotsky, 1987). Recent research began to focus on formative feedback’s potentials to help students generate internal feedback that informs learners how to meet standards and progress (Cauley & McMillan, 2010). Butler and Winne (1995) suggested that learners may use formative feedback for the purpose of self-monitoring. This key process can help them learn to generate internal feedback, thus fostering self-regulated learning.

The above literature, however, did not fully examine how students' motivations to learn are impacted by formative feedback. It has highlighted how formative feedback enhances the students' motivation from time to time (e.g., Kluger & DeNisi, 1996; McGarrell & Verbeem, 2007; Shute, 2008). However, the majority of these studies have regarded 'motivation' as a single-dimensional factor. There have been few, if any, studies that directly investigate how different types of motivations may interact differently with formative feedback strategies, and it is known different types of motivations could have very different effects on students. As an example, extrinsic and intrinsic motivations (Ryan & Deci, 2000) tend to exert the opposite impacts on student outcomes: The former is likely to produce students who are less persistent and interested in their learning, while the latter tends to create the utterly opposite result (e.g., Deci & Ryan, 2008). Thus, we argue that it is problematic for the current literature to ignore how formative feedback may influence different types of motivations differently. Therefore, this is a research gap which is in need of filling.

Moreover, higher education researchers could question whether the motivation toward learning alone is sufficient. Motivations are typically directed toward specific activities only (Kruglanski et al., 2002). A student can have strong motivation to learn in a course where the instructor is giving quality formative feedback, but have weak motivation to do the same for a course that does not have such an instructor. This can create problems for higher education as students most likely will not be taught by the same teacher across different courses. Therefore, one can doubt whether only the motivation in the course taught by a teacher who is applying formative feedback strategies can be considered sufficient as an outcome variable for students in higher education. Indeed, the higher education sector has increasingly emphasized students' overall academic development. The Commission of the European Union (2000), for instance, assigned the top priority to the implementation of lifelong learning for all its citizens by the year 2010 in its memorandum of lifelong learning. Hence, powerful interventions for higher education should also promote a motivation to learn outside the particular courses where they are put forth. There is a need to examine how formative feedback strategies influence overall motivational tendencies of students. With this in mind, we incorporate 'positive emotions' in our study. The current study, therefore, will not only provide a finer picture of how formative feedback is related to student motivation, but also give insight into how it impacts students' overall learning across the whole context.

17.1.3 The Theoretical Background

According to the Self-determination Theory (SDT; Ryan & Deci, 2000), in pursuing the goals they have, humans are driven by 2 major types of motivations: extrinsic motivation and intrinsic motivation. In the former case, the person is pursuing the goal for external rewards—such as money, prestige, or avoidance of punishment. A student, for example, may study with the goals of 'getting a better job'

or 'avoiding negative evaluation' in mind. In the latter case, however, the person is committed to the goal because of the inherent pleasure associated with the pursuit itself. For instance, some students could find learning an enjoyable activity and become committed to it for the sake of the said enjoyment. If this is true, the students could be said to demonstrate 'intrinsic motivation toward learning' (Lin, McKeachi, & Kim, 2001). In the higher education context, the intrinsic motivation toward learning has been shown to produce students who achieve higher grades (Lin et al., 2001) and pay more effort into study (Walker, Greene, & Mansell, 2006).

Distinction between these two types of motivations is commonly made in the education literature (but, apparently, not in the subdomain of 'formative feedback'). The current study seeks to examine how formative feedback interventions may impact extrinsic motivation and intrinsic motivation differently. Our hypotheses are based on the SDT literature (e.g., Deci & Ryan, 2008; Ryan & Deci, 2000). According to the SDT, intrinsic motivation is best fostered when a student perceives himself/herself as (1) doing an activity to pursue his/her own goals; and (2) doing an activity in the presence of a person he/she feels intimate with. The nature of formative feedback involves the teachers constantly monitoring the students' progress, while giving individualized feedback tailor-made to help students accomplish their respective study goals (e.g., Black, Harrison, Lee, Marshall, & William, 2003). The individualized nature of formative feedback means that lessons would be geared toward helping students fulfill their own study goals, instead of making them abide by arbitrary standards, fulfilling condition (1). Also, we suggest that the very essence of formative feedback requires teachers to develop a certain level of understanding of their students as individuals with differing needs, in order to give individualized feedbacks. This can urge teachers to become inclined to form emotionally close relationships with students, as such relationships are known to be essential for obtaining such information (e.g., Valkenburg & Peter, 2007), implying condition (2). Thus, the current study hypothesizes that formative feedback interventions will promote intrinsic motivation in students, but will have little effect on extrinsic motivation, which is not known to be affected significantly by conditions (1) and (2).

Other than this, we also include positive emotions in our study. The concept of 'positive emotion' has been extensively covered (Fredrickson, 2001; Fredrickson, Tugade, Waugh, & Larkin, 2003). It refers to a state where an individual tends to engage in 'approach behaviors' (Davidson, 1993), a set of behaviors associated with learning and opportunities. Fredrickson (1998) highlighted that positive emotion such as joy, contentment, and happiness signals the absence of danger, hence safety for the individual to explore the surroundings. Thus, positive emotional states serve the function of prompting humans to engage in exploratory behaviors that promote learning. This idea has been supported by research evidence. Positive emotions are known to facilitate curiosity and receptiveness to novel information (Silvia, 2005, 2008) and promote persistence in challenging tasks (Sansone & Smith, 2000). Moreover, it has been consistently shown that students who experience positive emotions in their learning tend to be more engaged, and

achieve higher (Goetz, Frenzel, Pekrun, Hall, & Ludtke, 2007; Pekrun, Goetz, Titz, & Perry, 2002). Most crucially, positive emotion is global: In a positive emotion, the individual will show approach behaviors toward activities around him/her as a whole, while ‘motivation’ is directed toward specific activities only. Based on this, we suggest that promoting positive emotions in the students is also relevant to the goals of higher education—to foster their overall learning, outside the courses with the formative feedback practices.

An often alluded to function of formative feedback is that it improves students’ emotion during learning. Scholars often suggested (but rarely demonstrated) that formative feedback helps clarify students’ uncertainty about their own levels of performance, and the reduction of uncertainty serves to reduce anxiety and thus cultivate the motivations to learn (Shute, 2008). Anxiety serves to signal the presence of potential dangers (Hirsh, Mar, & Peterson, 2012), and its absence signals the opposite. As a result, formative feedback, by reducing uncertainty felt by the students and hence the anxiety (or other negative emotions) they may experience, will lead to a lower probability that the students would perceive the presence of threat. Eventually, this is likely to cause a rise in positive emotions they experience. In sum, the current study proposes that (1) formative feedback practices will lead to increase in the intrinsic motivation to learn; (2) formative feedback practices will not affect extrinsic motivation; and (3) formative feedback practices will enhance the global positive emotional experience of students.

17.1.4 The Current Study

This study was conducted in the Department of Curriculum and Instruction (C&I) in a Hong Kong institute specialized in teacher education. The department offers courses that cover the topic of curriculum design. A set of formative feedback interventions was derived from the literature and applied to 3 student groups. These groups were given questionnaires to measure their motivations and experience of emotions. The data obtained from them was then compared to those of 3 student groups who had not received any interventions.

The first aim of this study is to investigate how formative feedback practices influence the students’ motivations (intrinsic vs. extrinsic) to attend the courses where the said practices are implemented. The second aim is to take one step further and investigate how they impact the students’ overall positive emotions—a measure which, we argue, can be seen as a global motivational tendency. The current study adopts a quasi-experiment design where two groups of students were compared. The first one, the experimental group, attended courses where a set of formative feedback strategies were derived from the literature and implemented, while the second group attended courses that received no interventions. The courses were a part of the institution’s plan to promote the use of formative feedback for teaching, taken in response to the Hong Kong government’s prompts to the education sector to adopt more student-centered pedagogies to enhance students’ motivation and

engagement (University Grants Committee, 2010). This is especially critical, considering the recent changes to the Hong Kong academic structures which have led to larger class sizes in universities, pointing to lower engagement. The University Grants Committee (2010), for instance, stated that ‘the implementation of the new academic structure will bring huge changes in academic and curriculum development ... The rationale of the new curriculum is to provide students with greater flexibility, more broad-based and student-centered learning experience.’ Hence, the current study is backed by a project which is not only centered merely on theoretical concerns, but also on practical ones.

17.2 Method

17.2.1 Design of Formative Feedback Interventions

The formative feedback practices put forward in the present study and their theoretical rationales have been summarized in Table 17.1. As shown in the table, all the said methods were derived from theories of feedback, and their effectiveness in providing formative feedback is known (Hattie & Timperley, 2007). The setting of study goals and the self-reflection upon the progresses on working toward learning goals are well-known formative feedback practices (Yang & Carless, 2013), and based on the SDT, they are likely to make students perceive that they are pursuing their own goals and therefore tap into ‘autonomy’ which is likely to induce intrinsic motivation. This is also based on the key idea that formative feedback’s strength

Table 17.1 Formative feedback strategies employed in the current study

Strategies	Justification and description	Examples of the practice
Setting study goals	Students were asked to put down their five study goals in priority order on a worksheet given at the course’s beginning	<ul style="list-style-type: none"> • One student responded that her key goal of learning is to ‘get well prepared to be a professional English teacher by knowing more about Hong Kong curriculum’
	This method is underpinned by the concept of feedback (Yang & Carless, 2013). Humans use discrepancies between goals and outcome feedback as the basis of evaluation of selves. These evaluations, in turn, affect their effort. Setting goals, thus, becomes the first step of motivating students to learn	

(continued)

Table 17.1 (continued)

Strategies	Justification and description	Examples of the practice
<p>Students' self-reflection of the intended learning outcomes</p>	<p>Students received a self-assessment tool via e-mail after they had completed lessons (usually one or two) of the same theme. They were provided with the lessons' intended learning outcomes for self-reflecting the level of achievements they should be able to achieve, by a 4-point scale. The overall self-reflection of outcomes will be discussed and followed up by the instructor (either in individual sections or in classes)</p> <p>The ideas from feedback suggested that students should be constantly urged to evaluate their own progress on learning goals (Hattie & Timperley, 2007). Similar to goal setting, students need constant information on their progress toward learning goals, as they base their self-evaluations on discrepancies between the goals and their current level. Discrepancies motivate effort</p>	<ul style="list-style-type: none"> • One of the intended learning outcomes that students responded for a lesson on 'formative assessment,' is 'After you studied this course, how well you think you are able to describe "formative assessment"?' • According to the response rate, it was noted that this item was reported an average of 3.51, which suggests that students were all confident that they can master the general knowledge on 'formative assessment'
<p>Teacher comments on in-process draft</p>	<p>The teacher gave comments on draft assignments in progress. Students could submit voluntarily in a limited number of words, for the interim and final written assignments. The main purpose is to help students troubleshoot their own performance and self-correct</p> <p>Constant information to students about their progress toward their goals could serve to prompt efforts to close the 'gap' between the goal and the current level. Positive feedback (praise for high achievers and encouragement for low achievers) from teacher could serve to give reinforcements to the students for working hard, and promote higher motivation to learn</p>	<ul style="list-style-type: none"> • In writing a topic on "What will be the constraints of introducing formative assessment in schools in Hong Kong?". A student submitted a draft idea through e-mail to the teacher, and teacher gave comments to scaffold the process of coming up with a more thoroughly elaborated idea. Below is a direct extract from the e-mail exchange between the student and the teacher, the underlined is the teacher's comment • The student wrote: Formative assessment can be conducted by formal and informal measures, teachers need to design or plan the assessment and prepare of them, and hence their workload will increase • The teacher remarked: Workload is the issue and the constraints come from not workload itself, this meaningful idea formative assessment is encouraged, however, teacher may need support so that they can be done well in practice— then you may mention briefly what you need in more specific terms, if not, teacher could be overloaded and becomes a barrier of change in reality

(continued)

Table 17.1 (continued)

Strategies	Justification and description	Examples of the practice
Verbal feedback on group tasks outputs	<p>The teachers gave verbal feedbacks on their students' ideas and outputs during in-class group tasks, such as in-class discussion</p> <p>The method is based on scaffolding, which refers to the process by which the students are led to start with more helps and supports, and then gradually move on to work on the problems on their own. Teachers' verbal feedback serves to provide information related to the students' current levels and probes for answers to in-class questions. The teachers, as seen in the lesson extracts, constantly prompted students to elaborate on their answers. In-class discussions were also used to provide peer scaffolding by the more skilled students to the less skilled ones</p>	<p><i>Sample lesson extract A:</i> (They were discussing the heavy workload of current Hong Kong teachers.)</p> <p>Teacher: What will be the reason for causing that heavy load for teaching? Student A: Parents' attitude Teacher: Very good. What pressure they cause you? Student A: They want their children to be excellent and therefore they may inspect on the level of the school Teacher: The level of the school. So that school has to work up to the level and show the achievement and also show they are able to support your students to have excellent result. So this causes teachers heavy tension today. Okay. So any other reason for causing the workload? Student B: The reforms</p> <p><i>Sample lesson extract B:</i> (The students were asked to draw a picture to represent feedback. Their pictures have been gathered and the teachers have prompted them to explain what they have drawn.) Teacher: It seems like a conclusion (she was pointing at one of the pictures.) So may I ask the group to explain this flowchart to me? Student: We think that feedback is important in the process of learning and making improvement. And there are two dimensions of learning. The first one is that teachers give positive feedback to make improvement and the other is that students can make feedback among themselves Teacher: Okay, very good. Now you raise something about self-learn and self-correction through the teacher's support on various forms of feedback. There is another word; that is, feedback is to help you self-regulate</p>

lies in informing students about their progresses toward their goals (e.g., Kuiper & Pesut, 2004) and thus prompts metacognition. Teacher comments on in-progress drafts also serve this role, but with the additional role of adding an element of close relationships to the teacher–student relations in the courses as teachers helping students reach their study goals can signal concern and thus foster the said

relationships (Jennings & Greenberg, 2009). Care was also taken to ensure that the comments are specific, with elaborated explanations of the students' progress, not generic ones like 'work harder' (Goodman, Wood, & Hendrickx, 2004). Lastly, the verbal feedback in-class helps reduce uncertainty students experienced, by the constant provision of information on quality of students' works, and can conceivably foster positive emotions. It can also effectively reduce the cognitive load of a learner by reducing the needs for them to understand their current levels of performance (Sweller, Van Merriëdboer, & Paas, 1998).

17.2.2 Participants

The participants were 127 students attending courses on teacher education. Among them, there were 79 females (62.2%) and 48 males (37.8%), and the mean age was 21.5 ($SD = 2.44$). They were recruited from a Hong Kong higher education institution that focused on teacher education. The vast majority of them (over 95%) were ethnic Chinese.

17.2.3 Study Design

This study employed a 2×2 mixed design, with two groups measured at two different points of time. The first group, the students who had gone through the interventions, would be referred to as the 'experimental group,' while the second one, the students who had not undergone the said interventions, would be referred to as the control group. Both of them responded to the questionnaires at two points of time (the first and last lectures of the courses they attended, respectively). The dependent variables included the students' intrinsic motivation to attend the courses, the extrinsic motivation to do so, and the positive affect they had felt over 'the past few weeks.' The current study was a quasi-experiment, in that it did not involve random assignment of participants. In total, students from 6 courses had participated in this study. 3 of these classes (68 students) belonged to the control group, while the other 3 (59 students) were of the experimental group. The experimental and control groups are from the class of similar size.

17.2.4 Procedure

Participants were asked to complete the questionnaires before first lessons of each of the courses—all of which were administered in the same semester—started. Those who did not were later sent e-mail reminders which requested them to finish the online version of the same questionnaire. All of them were told that the current

questionnaire was about their subjective experience during the courses. 202 questionnaires were gathered this way. By the end of that semester, the students were given a post-course questionnaire at their final lessons. Similarly, those who did not fill in the questionnaires were given a reminder in e-mail form to urge them to finish the online version. Another total of 171 questionnaires were gathered in this way at first, but with the use of e-mail reminders, another 30 questionnaires were collected, making a total of 201 questionnaires for the post-course dataset. However, not every student who had completed the pre-course questionnaire had done the post-course one. Only 127 students had handed in both sets of questionnaires, making 127 the total sample size of the current study. Finally, without any exception, all of the mentioned questionnaires (pre-course or post-course, hard-copies or online) assured on the first pages that all information the participants provided would be kept confidential and used for research purposes only.

17.2.5 Measures

The questionnaires comprised measures of extrinsic and intrinsic motivations to attend the courses, plus the positive affect students experienced over the few weeks before filling in the questionnaires. The majority (over 95%, as mentioned) of the participants were ethnical Chinese. Thus, the scale items were translated into traditional Chinese. However, an English version was given to those whose first language was English (some of the participants were exchange students from overseas).

Motivation. The motivation scale of Noels, Pelletier, Clément, & Vallerand (2000) was used to measure students' motivation to attend the courses. The initial version of the scale consists of 21 items in total, with 3 items to measure each class of motivations from the most lacking to the most intrinsic. It is a standardized, validated instrument for measuring students' motivation within the higher education context. It was used to measure their degrees of motivations to pursue a given goal (in the case of the current study, to attend the courses they were attending). The construct of motivation was operationalized as a self-reported response to the goals, assessed via a Likert scale whose values ranged from 1 ('Strongly Disagree') to 5 ('Strongly Agree'). 6 items were included in the questionnaire. Among them, 3 were from the extrinsic subscale, while 3 were from the intrinsic subscale. Exploratory factor analysis was conducted.

Positive affect. The Positive Affect and Negative Affect Scale (PANAS; Watson et al., 1988) was used to measure the participants' experience of positive affect. It was a 20-item scale composed of 2 subscales: One concerns respondents' subjective positive affect, while the other measures their negative affect. A list of emotions (e.g., joy, proud, and enthusiastic; 10 were positive, 10 were negative) were given in this scale, and the respondents were asked to rate how frequently they have experienced the emotions over a given period, on the scale of 1 (never) to 5

(always). In the current study, they were asked to rate their experience of the ten positive emotions ‘over the past few weeks.’

Analyses. After obtaining the satisfactory reliabilities on every construct, each of them had a mean value obtained from averaging the items. There were 6 constructs in this study: the participants’ pre-course/post-course intrinsic motivation, pre-course/post-course extrinsic motivation, and pre-course/post-course positive affect. Intrinsic motivation, extrinsic motivation, and students’ positive affect were examined using the two-way mixed ANOVA. This is especially vital considering the current study’s quasi-experimental nature. It was to test whether the group (experimental vs. control) x time (pre-course vs. post-course) interaction is significant, beyond the main effects of each of the two.

17.3 Results

17.3.1 Descriptive Statistics and Correlation Analyses

Table 17.2 presents descriptive statistics and bivariate correlations of the variables. At both Time 1 and Time 2, intrinsic motivation and extrinsic motivation were positively correlated with each other. Positive affect was positively correlated with intrinsic motivation but not extrinsic motivation.

Table 17.2 Descriptive statistics and bivariate correlations of variables (*N* = 127)

Variable	1	2	3	4	5	6	7	8	9
<i>Time 1</i>									
1. Intrinsic motivation	–								
2. Extrinsic motivation	0.29**	–							
3. Positive affect	0.38**	0.16	–						
<i>Time 2</i>									
4. Intrinsic motivation	0.47**	0.11	0.29**	–					
5. Extrinsic motivation	0.21*	0.37**	0.33**	0.26**	–				
6. Positive affect	0.23*	0.10	0.29**	0.73**	0.15	–			
Mean	3.56	3.70	2.93	3.65	3.56	3.28	4.63	2.66	2.96
SD	0.65	0.68	0.66	0.88	0.75	0.91	0.96	0.57	0.56

Note **p* < 0.05. ***p* < 0.01

17.3.2 *Intrinsic Motivation and Extrinsic Motivation*

Exploratory factor analysis was conducted to examine whether scale items of intrinsic motivation and items of extrinsic motivation loaded on separate factors as expected. With the use of promax rotation, two factors with eigenvalues greater than 1 emerged. This two-factor solution explained 68.23% variance of the data. As expected, the 3 items measuring intrinsic motivation loaded on their own factor, with all loadings greater than 0.64; while the 3 items measuring extrinsic motivation also loaded on their own factor, with all the loadings greater than 0.78. This factor structure concurred with the factor structure of the motivation scale by Noels and colleagues (2000). Both intrinsic motivation and extrinsic motivation scales were found to be reliable, with Cronbach's alphas 0.80 and 0.70, respectively. Table 17.3 presents the items of each scale and their corresponding factor loadings.

17.3.3 *Intrinsic Motivation*

A 2 (group) \times 2 (time) mixed ANOVA, with group as the between-subject variable and time as a within-subject variable, was conducted to examine the effects of group and time on students' intrinsic motivations in the course. There was a significant main effect of group, $F(1, 124) = 37.40, p < 0.001, \eta^2 = 0.23$, with students in the experimental group ($M = 3.95, SD = 0.58$) reporting higher intrinsic motivation than those in the control group ($M = 3.32, SD = 0.58$). There was no significant main effect of time, $F(1, 124) = 2.85, p = 0.09, \eta^2 = 0.02$. Most importantly, there was a significant interaction effect between group and time, $F(1, 124) = 17.63, p < 0.001, \eta^2 = 0.12$. Specifically, the students from the experimental group

Table 17.3 Items, factor loadings, and Cronbach's alphas for intrinsic motivation and extrinsic motivation scales

Items	Factor 1	Factor 2
<i>Extrinsic motivation ($\alpha = 0.70$)</i>		
• I want to get a more prestigious job later on by knowing about the subject matter	0.849	0.368
• I want to have a better salary later on by completing all the courses	0.860	0.346
• I want to fulfill the university requirement	0.643	-0.025
<i>Intrinsic motivation ($\alpha = 0.80$)</i>		
• I think that I will enjoy acquiring knowledge about the course materials	0.306	0.782
• I think that I will experience pleasure when I surpass myself in knowledge on the course materials	0.153	0.883
• I think that I will feel satisfied when I am in the process of accomplishing difficult exercises in the course	0.258	0.856

Note Factor 1 = Extrinsic motivation; Factor 2 = Intrinsic motivation

Fig. 17.1 Interaction between group and time on students' intrinsic motivation in the course

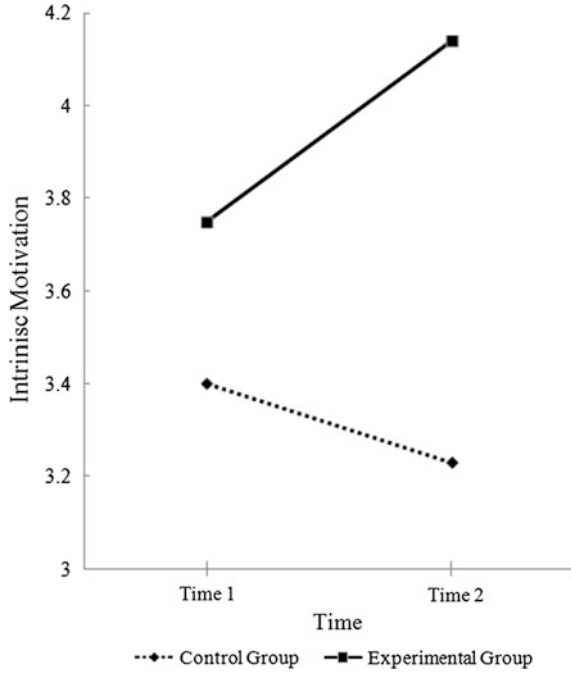


Table 17.4 Means and standard deviations of intrinsic motivation, extrinsic motivation, and positive affect in experimental and control groups at Time 1 and Time 2

	Control group (<i>n</i> = 68)		Experimental group (<i>n</i> = 59)	
	Time 1	Time 2	Time 1	Time 2
Intrinsic motivation	3.40 (0.62)	3.23 (0.72)	3.75 (0.63)	4.14 (0.79)
Extrinsic motivation	3.75 (0.66)	3.49 (0.73)	3.66 (0.68)	3.68 (0.70)
Positive affect	2.82 (0.67)	2.97 (0.75)	3.05 (0.65)	3.65 (0.93)

Note Values in parentheses are SD. Means not sharing a common subscript differ significantly from one another at $p < 0.05$

reported significantly higher intrinsic motivation at Time 2 ($M = 4.14, SD = 0.79$) than Time 1 ($M = 3.75, SD = 0.63$), $t(57) = 3.620, p = 0.001, Cohen's d = 0.47$, implying that they reported higher intrinsic motivation after taking the course. In contrast, students of the control group reported significantly lower intrinsic motivation at Time 2 ($M = 3.23, SD = 0.72$) than Time 1 ($M = 3.40, SD = 0.62$), $t(67) = 2.06, p = 0.04, Cohen's d = 0.25$, meaning that they reported lower intrinsic motivation after taking the said courses. Figure 17.1 presents the intrinsic motivation of students in experimental and control groups at Time 1 and Time 2. Table 17.4 presents an overview of the findings on the outcome variables.

17.3.4 Extrinsic Motivation

Similarly, a 2 (group) \times 2 (time) mixed ANOVA was conducted to examine the effects of group and time on students' extrinsic motivation in the courses. There was no significant main effect of group, $F(1, 122) = 0.29, p = 0.59, \eta^2 = 0.002$, and no significant main effect of time, $F(1, 122) = 2.85, p = 0.09, \eta^2 = 0.02$. There was a significant interaction effect between group and time, $F(1, 122) = 4.09, p = 0.045, \eta^2 = 0.03$. Specifically, students in the experimental group reported similar levels of extrinsic motivation at Time 1 ($M = 3.66, SD = 0.68$) and Time 2 ($M = 3.68, SD = 0.70$), $t(56) = 0.224, p = 0.82, \text{Cohen's } d = 0.02$. In contrast, students in the control group reported significantly lower extrinsic motivation at Time 2 ($M = 3.49, SD = 0.73$) than Time 1 ($M = 3.75, SD = 0.66$), $t(66) = 2.78, p = 0.007, \text{Cohen's } d = 0.34$. Figure 17.2 shows the extrinsic motivation of students in the experimental and control groups at Time 1 and Time 2.

17.3.5 Positive Affect

A 2 (group) \times 2 (time) mixed ANOVA was conducted to examine the effect of group and time on students' positive affect during the courses. We noted a

Fig. 17.2 Interaction between group and time on students' extrinsic motivation in the course

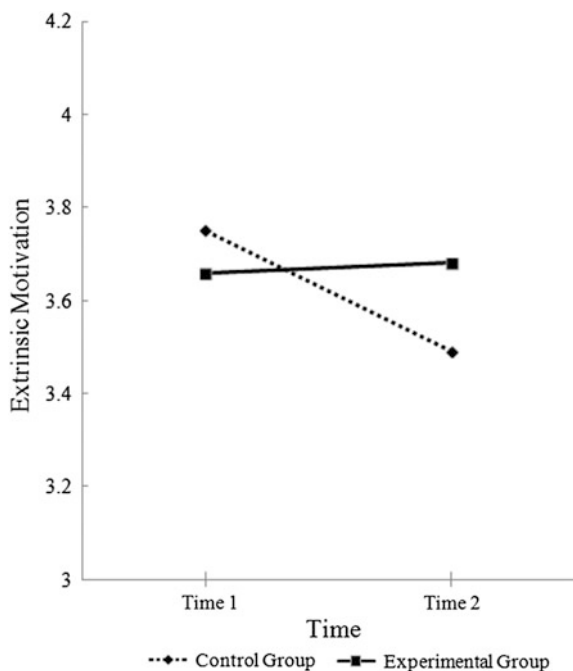
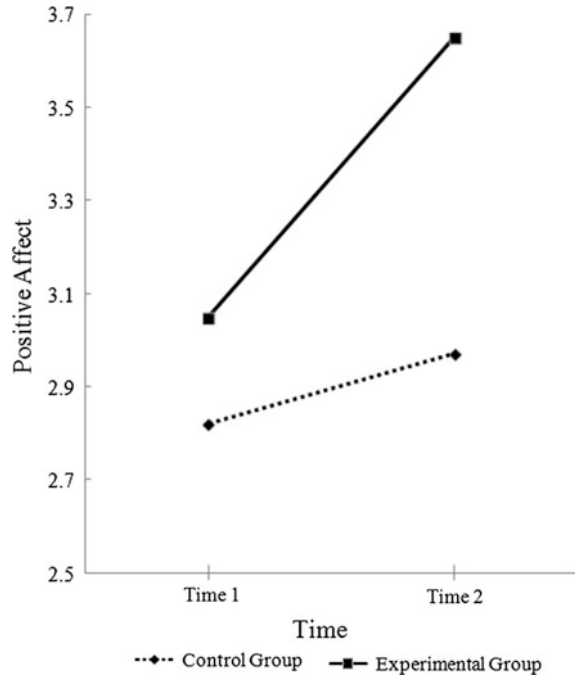


Fig. 17.3 Interaction between group and time on students' positive affect in the course



significant main effect of group, $F(1, 118) = 17.08$, $p < 0.001$, $\eta^2 = 0.13$, with students from experimental group ($M = 3.35$, $SD = 0.59$) reporting more positive affect than those in the control group ($M = 2.90$, $SD = 0.60$). The main effect of time was also significant, $F(1, 118) = 19.31$, $p < 0.001$, $\eta^2 = 0.14$, with students reporting more positive affect at Time 2 ($M = 3.29$, $SD = 0.90$) than Time 1 ($M = 2.93$, $SD = 0.66$). Most importantly, there was a significant interaction effect between group and time, $F(1, 118) = 7.17$, $p < 0.01$, $\eta^2 = 0.06$. Specifically, students in the experimental group reported significantly more positive affect at Time 2 ($M = 3.65$, $SD = 0.93$) than Time 1 ($M = 3.05$, $SD = 0.65$), $t(56) = 4.18$, $p < 0.001$, *Cohen's d* = 0.56. By contrast, students in the control group reported similar levels of positive affect at Time 1 ($M = 2.82$, $SD = 0.67$) and Time 2 ($M = 2.97$, $SD = 0.75$), $t(62) = 1.52$, $p = 0.13$, *Cohen's d* = 0.19. Figure 17.3 presents the positive affect of students in experimental and control groups at Time 1 and Time 2.

17.4 Discussion

The current study has obtained two major findings. Firstly, formative feedback practices have vastly different impacts on different types of motivations. These practices exert positive influence on the students' intrinsic motivation, and their intrinsic motivation would otherwise decline. This is much in line with our prediction. In contrast, the effects on extrinsic motivation appeared a little trickier. The current formative feedback interventions seem to have exerted a 'protecting' effect on the students' extrinsic motivation to attend the courses: While students from the experimental group experienced no changes in their extrinsic motivation, their counterparts from the control group underwent a decline in this type of motivation. One possible explanation for this is that much as the Hong Kong government suggested, the changes in the academic structure—from 3-year to 4-year university curriculum—recently put forth has led to larger class size and greater diversity in students' abilities (Hong Kong Examinations and Assessment Authorities, 2014). Since these factors tend to lead to reduction in student engagement (Finn, Pannozzo, & Achilles, 2003), it is conceivable that students who attended the courses without the interventions experience a drop in their (both intrinsic and extrinsic) motivations to attend. Formative feedback practices involve letting students pursue their own goals, some of which may have been extrinsic, such as to 'obtain a higher salary in the future.' Because of this, the practices could have indirectly fostered their motivations to seek these goals to a certain degree. Hence, though the formative feedback did not cause a notable increase in extrinsic motivation, it could 'protect' it to some extent. This remains a possibility for future research to explore. Secondly, we have found that formative feedback practices could lead to increase in students' overall experience of positive emotions. The measure adopted in the current study is a global measure of positive emotional experience which encompasses the students' affectivity in the 'past few weeks' for the times when the measurements took place, and hence, includes the students' experience 'outside' the courses. The current study shows that students in the experimental group underwent a rise in their global positive emotional experience, while the ones in the control group did not change at all. This is also in support of what we have suggested: Formative feedback fostered positive emotional experience and thus could potentially lead students to develop higher engagement in learning activities outside the courses where the teaching was conducted. The mechanisms of this relationship, however, remain an area for laboratory studies to further look into. This study has successfully achieved its main objectives.

17.4.1 *Implications of the Findings*

One notable impact of the current study is that it has further strengthened the research on formative feedback and its effects on motivation. Instead of following

the current literature's tradition of treating 'motivation' as being a single dimension, this study, to our knowledge, is among the first pieces of research to investigate how formative feedback can affect different types of motivations differently. This is of vital importance as it casts doubt on a considerable portion of the literature. The previous research on formative feedback generally referred to motivation as simply 'motivation' (e.g., McGarrell & Verbeem, 2007; Shute, 2008). We have demonstrated that formative feedback practices can exert different influences on intrinsic and extrinsic motivation. Therefore, researchers can no longer be assured that the prior studies on formative feedback and motivation can be compared with each other: It may be that some of them were using intrinsic motivation as an outcome variable, while the others may have been using extrinsic motivation instead. Hence, the present study urged scholars to make a clearer distinction between the two types of motivation in formative feedback research.

Moreover, the current study is also notable in its consideration of positive emotions the students experienced. Even though emotions have been mentioned or alluded to by formative feedback studies on a few occasions (Shute, 2008; Song & Keller, 2001), the current study is one of the few studies that conclusively demonstrates the effects of formative feedback on the positive emotions experienced by students. This serves to demonstrate that the effects exerted by formative feedback can not only impact learning activities where it is carried out, but also extend to influence the students' motivational tendency as a whole. This shows that formative feedback may benefit more than just students' academic development. Due to the importance of positive emotions to well-being (e.g., Fredrickson & Joiner, 2002), it would be conceivable that formative feedback may have wider implications for students—it might be vital for their social and emotional development as well. Although the current study does not examine such a possibility, it is a potential arena for future research.

17.4.2 Implications for Teaching Practices

To teaching professionals, the formative feedback practices studied in the current study are of relevance. The practices shown in Table 17.1 may help promoting better affectivity and motivational tendencies among students in many ways. Setting study goals, for instance, can encourage students to provide inputs into their learning, and the said inputs will be followed up with self-reflection. These practices likely tap into the students' autonomy needs, the need for the perception that one is committed to activities he/she actively chooses to do. While it is a commonly cited facilitator for intrinsic motivation (Deci & Ryan, 2008), studies have found that it is important for overall psychological well-being as well (e.g., Chirkov, Ryan, Kim, & Kaplan, 2003). Around the globe, higher education increasingly emphasizes students' growth in nonacademic domains (e.g., Gurin, Dev, Hurtado, & Gurin, 2002). Therefore, it becomes in particular important for teachers to consider adopting these teaching practices, and on a wider scope, ponder over new

measures that tap into students' autonomy needs. The current study hypothesizes that the element of 'choice' is the key to tapping into such needs. Thus, teachers in higher education can consider incorporate choice into other aspects of their teaching, such as content materials and delivery modes of their courses.

The teachers' comments on in-progress drafts may also have contributed to motivational and emotional outcomes of students. By giving individualized comments on students' works, teachers may get to know their students' individual needs better. Such a rise in awareness of individual students' needs may have contributed to better teacher–student relationships (e.g., Cornelius-White, 2007). This does not only tap into 'relatedness'—the needs for close and warm relationships—another effective facilitator of intrinsic motivation (Ryan & Deci, 2000), but can also lead to better emotional outcomes. Close relationship has long been known to be a key factor that fosters psychological well-being (e.g., Ryan & Deci, 2001). Thus, teachers' comments on in-progress drafts could also be of value to teachers who would like to promote emotional wellness in their students. However, based on our argument, it would be preferably paired with cues of close relationships, such as teachers' eye contact with students and warm, friendly tones when talking.

Lastly, the verbal in-class feedback given to the students is also noticeable. In the setting of higher education, in-class verbal feedback is known to be essential in informing students about their progresses (Johnson, Johnson, & Smith, 1991; Shute, 2008). Most likely, as stated by previous researchers, this could help reduce uncertainty the students felt about the seeking of their own study goals and thus the negative emotions associated with learning. Based on this reasoning, formative feedback must be specific. Indeed, this is what much prior research has reported (e.g., Williams, 1997). According to Shute (2008), 'specific (or elaborated) feedback provides information about particular responses or behaviors beyond their accuracy and tends to be more directive than facilitative' (p. 5). It is essential for teachers to provide a set of feedback that highlights aspects in students' thinking and behaviors to guide them on what to alter in order to better achieve their study goals.

Correspondingly, the investment of time for conducting formative feedback, as come into play, can be considered as huge as compared with ordinary teaching in higher education. The time and effort in preparing the lecture and following up student feedback outside classroom, as well as the growing class size of students in higher education, should be one of the constraints of putting formative assessment in full practice, albeit its advantages, as time is a major inhibiting factor of implementing teaching innovations. While the study was conducted on classes with a relatively moderate size of 35, the teacher had actually utilized the use of simultaneous e-learning platform in prompting student responses. This has appeared to be one of the potential elements that can be further explored to support the implementation of formative assessment, so to remove some of the obstacles as discussed in the literature.

17.4.3 Research Limitations

While the current study has obtained some promising results, it is not by any measure free from limitations. Firstly, this study is a quasi-experiment, without random assignment of participants into groups. This may pose problem as the two groups may not have started with the same initial conditions. In fact, according to our mixed ANOVA, the two groups of students did not have the same level of intrinsic motivation to attend the courses at the beginning. This may have confounded our research findings. Therefore, future studies with finer control should be conducted. Secondly, the current study is a cross-sectional one which does not address the long-term effects of formative feedback on students. However, increasingly, higher education emphasizes lifelong learning (e.g., Boud & Falchikov, 2007). Therefore, it is also needed to investigate how formative feedback may impact long-term outcomes such as the students' goal orientations in learning (Summer & Svinicki, 2007) over time. Finally, the study intended to report the design of formative feedback strategies and the positive results of applying such assessment approach on psychological outcomes of studying the courses, and we have not included the analysis of academic outcomes in this chapter. We will report the quality of coursework and the overall academic results compared with the previous year to broaden the conceptualization of this study, which we have attempted to identify in subsequent stage of our study. Further research on how formative feedback support can be extended to outside classroom practice can be a good direction for future research.

17.4.4 Contributions to SoLT

In line with the chief goal of SoLT to improve student learning, this chapter presents a rigorous scholarly inquiry into the design, implementation, and outcomes of formative assessment strategies to enhance students' motivation of learning and create positive emotion to students in the context of higher education in Hong Kong. The intervention using formative assessment strategies has employed digital technology, which is a core element of the SoLT framework proposed in this book series. The intervention involved the regular use of Moodle (a learning management system) to engage students in setting learning goals and conduct self-assessment of learning in relation the CILOs. The students' online self-assessment took place anytime and anywhere without the confinement of the classroom. In this way, this chapter provides a good example of how teachers can broaden the conceptualization of learning and teaching in SoLT.

The study, with the support of a Teaching Development Grant, has been widely disseminated during and after the completion of the teaching development project, through the annual teaching and learning conferences of the university, seminars and staff development workshops organized for new academic staff of the

university. The project outputs including instructional design of eleven formative feedback strategies, teaching videos demonstrating the use of feedback strategies, and artefacts showing progress work outputs of participating students are also shared over Web site 'Active Classroom' (AClass: <http://www.eduhk.hk/aclass>) for open access to the public. The potential of such an intervention study on a newly promoted educational idea in the higher education has demonstrated its scholarly impact through the extensive dissemination of the various scholarly events and an e-platform. The impact of the study does not only limited to the education community, but it also reaches beyond Hong Kong to the worldwide to benefit practitioners who aim at promoting student learning through learner-centered pedagogies and those who are interested in using systematic research inquiry approaches to study and reflect on the outcomes of teaching innovations.

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Chapter 18

Using ICT to Facilitate Instant and Asynchronous Feedback for Students' Learning Engagement and Improvements

Gary Ka-Wai Wong and Min Yang

Abstract Information and communication technology (ICT) plays a critical role in students' learning engagement and improvements by providing them with learning support through increased teacher–student and peer interactions. One way to afford such support is through the use of instant feedback and asynchronous feedback facilitated by online, mobile, and game-based learning tools. By examining an empirical case study of our own classroom, this chapter explores the research question: How can ICT be used to facilitate instant feedback and asynchronous feedback for students' learning engagement and improvements? Using learning tools such as instant response system and learning management system affording instant and asynchronous feedback, students were provided with constant learning support. Findings from classroom observations, student focus groups (n = 15), and teacher interview (n = 1) affirmed the capacity of ICT for generating instant feedback and asynchronous feedback, which enhanced students' learning engagement, collaborative knowledge building, and autonomy as active learners.

Keywords Information and communication technology (ICT) • ICT-supported formative assessment tasks • Instant feedback • Asynchronous feedback, dialogues • Feedback approaches • Sustainable learning support

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18.1 Introduction

Since the publication of Black and Wiliam's (1998) pioneering work on advancing formative assessment to support students' continuous learning progress, the role of feedback in improving student learning and performance has been increasingly recognized in assessment policy and practice of higher education institutions (Yorke, 2013). *Formative assessment* is the process of gathering data on students' knowledge, skills, and learning progress and using such data to inform actions taken by teachers and students, with a view to improving learning and teaching (Sadler, 1998). An essential element of formative assessment is the provision of feedback to students. *Feedback* refers to the information about the distance between a student's or a group of students' current and expected levels of knowledge and skills for the purpose of assisting students to achieve enhanced academic or professional performance (Hattie, 2009).

Existing research has evidenced the significant effects of feedback on students' learning engagement (Gibbs & Simpson, 2004; Nicol, 2009) and improvements of student performance (Clark, 2012; Hattie & Timperley, 2007). Effective feedback promotes desirable learning outcomes, such as increased learning motivation and interest, deep understanding, capabilities of self-assessment and self-monitoring, willingness to contribute to collaborative knowledge building with peers and teachers, and a sense of autonomy as active learners (McNeill, Gosper, & Jing, 2012; Nicol, 2009). Hyatt (2005), Nicol (2010), Price, Handley, Millar, and O'Donovan (2010), and others comment on one-way transactional feedback process dominated by teachers (e.g., end-of-term written feedback on assignments) as being insufficiently engaging for students and reinforcing imbalanced teacher-student power relationships. Thus, to enhance the quality of feedback and increase students' uptake of feedback, researchers such as Bloxham and Campbell (2010), Ormond, Maw, Park, Gomez, and Crook (2013) and Sadler (2013) argue for the need to involve students in dialogues with teachers and peers that generate recursive, timely, and relevant feedback.

In higher education, the majority of feedback studies have tended to concentrate on the provision of timely and clear written commentaries on graded assessment tasks (Evans, 2013). Such studies have identified approaches to engendering feedback dialogues, for example, discussion of rubrics (Panadero & Jonsson, 2013), self- and peer-assessment (Handley & Williams, 2011), and multistage assignments (Hounsell, McCune, Hounsell, & Litjens, 2008), which may increase the quality and quantity of feedback for students. While existing findings provide valuable insights into the role of feedback dialogues in improving students' performance in assessment tasks, to advance the field further, more investigations should be undertaken to examine feedback approaches through formative assessment tasks that can be operationalized in everyday classrooms (Black & Wiliam, 2009).

With the expanded use of information and communication technology (ICT) in higher education classrooms, current research has begun to demonstrate how ICT may play a crucial part in engendering feedback dialogues through formative

assessment tasks making use of ICT (Gikandi, Morrow, & Davis, 2011). Examples of such tasks may include online discussions and quizzes in learning management systems (LMSs, such as Moodle) (Jones & McLean, 2012), collaborative writing using social media tools (e.g., blogs and wikis) (Chen, Liu, Shih, Wu, & Yuan, 2011), reflective journals and artifacts in e-portfolio systems (e.g., Mahara) (Crisp, 2012), and multiple-choice questions (MCQs) using clickers or mobile devices via instant (or classroom, personal, or audience) response systems (Dunn, Richardson, Oprescu, & McDonald, 2013). Such tasks may be used as everyday classroom activities designed to scaffold students' progressive learning, or as assignments contributing to students' final grades. The kinds of tasks examined in this chapter are mainly learning tasks supported by ICT. Researchers alert that the use of ICT on its own does not guarantee enhancement of students' learning engagement and achievements (Crisp, 2012). This can be exemplified by certain students' experiences of peers' free riding in small group tasks and lack of sufficient teacher presence and/or guidance leading to decreased motivation or unsatisfactory performance when engaged in online learning environments (Nicol, 2009).

To fully support students' learning through formative assessment tasks that are supported by ICT, teachers may consider the use of purposeful task design to assist students' sustained effort in completing tasks, as well as careful scaffolding and feedback to facilitate students' meaningful learning (Yang, Tai, & Lim, 2015). To contribute to the emerging trend of research into the role of ICT in effective feedback provision in higher education, the present chapter sets out to explore the *key research question*: How can ICT be employed to facilitate instant feedback and asynchronous feedback for students' learning engagement and improvements in everyday classrooms?

Through the critical examination of an empirical case study of our own classroom in an undergraduate general education course, this chapter explores how two commonly used forms of ICT-supported feedback, namely instant feedback and asynchronous feedback, were facilitated through different ICT-supported formative assessment tasks both inside and outside the classroom to provide students with sustained cognitive and social support. Qualitative data were obtained via classroom observations, a teacher interview (n = 1), and three student focus groups (n = 15) in order to investigate the teacher's and students' feedback experiences in the everyday classroom.

18.2 Defining Instant and Asynchronous Feedback

Researchers have examined how multimodal feedback strategies including teacher feedback and self-feedback and/or peer feedback can be incorporated into ICT-supported formative assessment tasks for students' increased opportunities to obtain and act upon feedback (Barbera, 2009; Dunn et al., 2013; Nicol, 2007). Apart from these human-initiated feedbacks, certain ICT applications enable system-facilitated instant feedback, such as tailored feedback messages on incorrect

answers to online quiz questions (Jordan & Mitchell, 2009). A significant contribution of this chapter lies in the exploration of how ICT-supported formative assessment tasks may be implemented to support reiterative feedback dialogues through the provision of instant feedback and asynchronous feedback. Investigating how the combined use of these three forms of feedback afforded meaningful feedback dialogues to assist students' learning engagement and improvements is the focus of the current chapter.

The literature is often lacking in explicit definitions of different forms of feedback facilitated through the use of ICT in students' tasks. In this chapter, distinction is made between three forms of feedback, namely instant feedback, asynchronous feedback, and immediate feedback. *Instant feedback* refers to instant results shown by online, mobile, or game-based learning devices, such as online game systems and instant response systems, which provide feedback instantaneously as students take actions or submit responses to the system (c.f. Rolfe, 2011). Such results serve as feedback through students' comparison of their personal responses to the collective responses shown on the lecture room screen, which may trigger students' self-feedback as to how to improve their approaches to tackling learning problems. *Asynchronous feedback* is typically associated with feedback given/received asynchronously (i.e., there is a gap in time between the completion of students' responses/products and the provision of feedback), such as teacher feedback or peer feedback on online group tasks and e-mail messages containing feedback commentaries (c.f. Gikandi et al., 2011). *Immediate feedback* is usually verbally delivered commentaries or suggestions offered by the teacher or peers immediately following a student's (or a group's) contribution to a discussion question or in-class task during class (Clark, 2012). Immediate feedback is also often accessible to students via out-of-class consultation sessions with teachers. Since these forms of feedback arise from the immediate learning situations in which students find themselves, such feedback are likely to be detailed and timely, thus ensuring the provision of regular and informative feedback that is conducive to students' improved understanding and increased motivation to learn (Evans, 2013).

Researchers have explored how strengthened learning support may be afforded by instant feedback facilitated via ICT applications, such as instant response systems (Dunn et al., 2013), Turnitin (Rolfe, 2011), and interactive concept maps (Po-Han, Gwo-Jen Hwang, Milrad, Hui-Ru, & Yueh-Min, 2012). One example of innovative uses of instant feedback was reported in Nicol and Boyle's (2003) study. In their study, tutors used MCQs to start science and technology major students' peer discussions in small groups before they submitted answers to the instant response system. Instant feedback was then presented by the system, followed by a whole-class discussion in which tutors elicited student groups' contributions before commenting on their responses. In this scenario, instant feedback available through the application was combined with immediate teacher feedback and peer feedback to provide students with cognitive support by scaffolding their critical thinking and self-reflection. The interactive learning environment afforded by ICT gave students social support as well, so that learning through errors was encouraged and students

were enabled to co-construct knowledge with their teachers and peers in the classroom.

While research into the pedagogic benefits of instant feedback remains scarce, a considerable number of studies have been reported on how asynchronous feedback mechanisms facilitated through teacher–student and peer interactions in online learning environments afford learning support. Gikandi and associates' (2011) review of studies on online formative assessment suggests that students' engagement in individual and group tasks in LMSs and e-portfolio systems can afford rich potential for teacher feedback and peer feedback through asynchronous online interactions. Critics, however, caution that insufficient teacher guidance and inappropriate curriculum and assessment design may lead to students' passive learning and disengagement in the feedback process (Yang et al., 2015).

18.3 The Case Study

This section discusses the course being studied in the case study as well as ICT-supported learning tools used to facilitate instant and asynchronous feedback for students' enhanced learning.

18.3.1 The Course Being Studied

A general education (GE) course taught by the first author was examined in the current study. Entitled “GED1032/GEH1021 Technology, Entertainment and Mathematics,” the course guided students to uncover the hidden secrets of mathematics as it is applied in the context of modern technology and entertainment. Students explored how the rich applications of mathematics in diverse disciplines (e.g., natural science, information technology, business, and arts) contribute to everyday problem solving and enhancement of people's lives. By exploring everyday encounters with mathematics, students developed understanding of numbers and mathematical concepts in a practical approach. Focusing on applications of mathematics in technology innovations, the course included different topics such as personal identity, electronic payment, computing and communication, digital multimedia, natural science, and gaming. Fifteen students were enrolled, who were taught in 3-h interactive lectures and were assessed by a quiz, a group presentation, and a final project.

18.3.2 Educational Technology Used in the Course

The course employed different online, mobile, and game-based learning tools to promote social interactions and provide instant and asynchronous feedback.

18.3.2.1 Using Moodle for Asynchronous Feedback

As a popular online learning tool, which is usually implemented institution-wide, Moodle was chosen to be the learning management system (LMS) for the course. Course materials were disseminated in this LMS, where students were expected to retrieve the materials and exchange ideas. The discussion forum on Moodle was used to allow students to discuss, contribute, and comment on selected topics. The Moodle system was accessible by computers and mobile devices (e.g., smartphone or mobile tablet), so that students were able to participate in online learning anywhere at any time. Moodle also allowed the sharing of various types of contents, such as Web links, polling, and embedded video clips. Studies have shown that LMSs such as Moodle enable teacher feedback and peer feedback via private messages or posts in the discussion forum (Nedeva, 2005; Rubin, Fernandes, Avgerinou, & Moore, 2010). Moodle also provided convenient e-mailing and internal messaging functions, which allowed the teacher to provide regular preclass and post-class feedback.

18.3.2.2 Applying Socrative for Instant Feedback

A mobile-supported instant response system, Socrative, was employed in the course to facilitate in-class tasks and interactions. Socrative enables activities such as single quiz questions (e.g., multiple choices, true/false, open-end questions) and competitions (Space Race). Students' responses are instantly available on the teacher's dashboard and projected to the lecture room screen (see Fig. 18.1). The system is accessible by students with "room numbers" assigned by the teacher via any computing system including mobile devices (see Fig. 18.2). The previous research shows that this type of applications can enhance students' participation when integrated into in-class tasks (Wash, 2014), offering a simple solution to engage students actively in classroom learning (Blackburn & Stroud, 2015).

Wong's (2014) study suggested that students were eager to bring their own mobile devices (e.g., iPad and smartphones) to class when asked to do so, implying that learning with such devices was attractive to them. Kong and Song's (2015) study showed that learning with mobile devices enhanced students' social interactions with peers and their self-reflection. In the course under study, students were encouraged to bring their own mobile devices, though some iPads were available for those who did not bring their mobile devices.

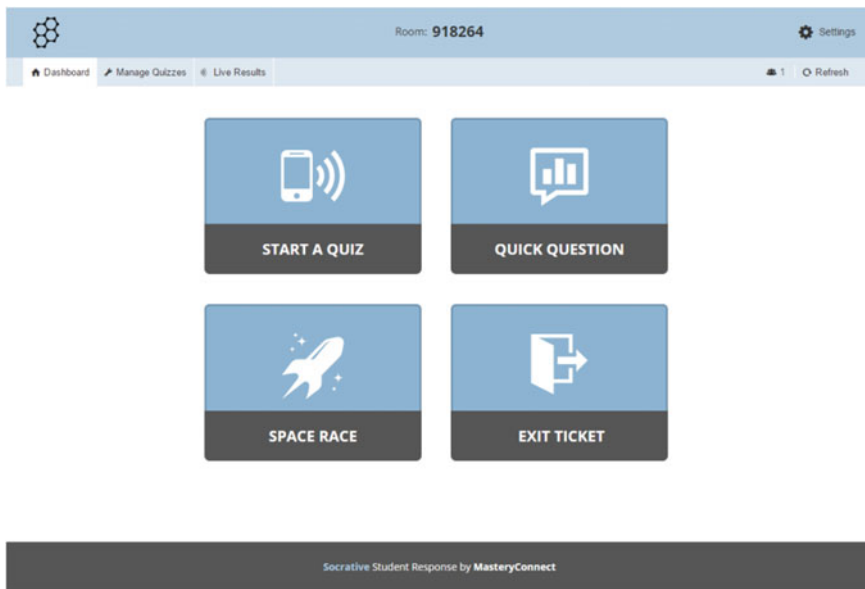


Fig. 18.1 Socrative (teacher—desktop) interface with different features for sending and receiving feedback to and from students

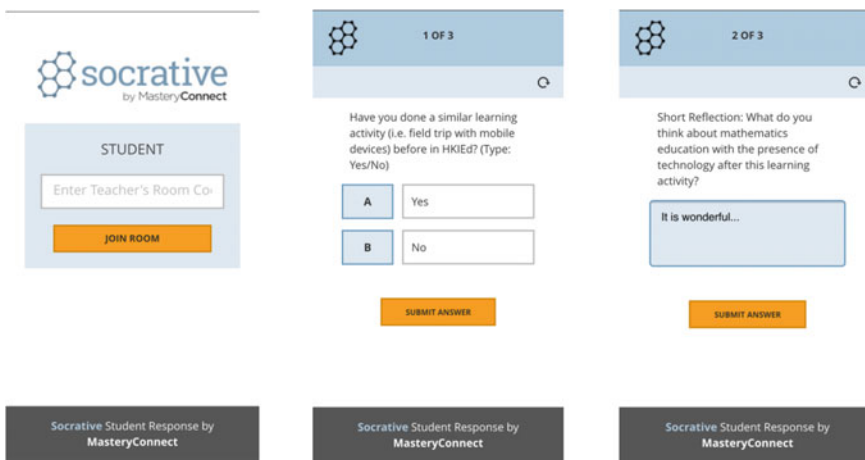


Fig. 18.2 Socrative (student—mobile) interface with login to assigned rooms (left) for instant response tasks (e.g., polling (middle) and open-end questions (right))

18.3.2.3 Employing Google Drive for Instant Feedback

Another mobile learning application used in the course was Google Drive. In one of the two observed lessons, students worked in small groups to undertake Web search about major computer scientists’ backgrounds, including their gender, origin, date of birth, educational backgrounds, and contributions to computer science. Students submitted their findings to an online form created on Google Drive. The summary of their submissions was subsequently displayed live on the lecture room screen (see Figs. 18.3, 18.4, and 18.5). The task was designed to convince the students that most pioneers in computer science were originated from the field of mathematics. This example demonstrates the potential of Google Drive to support students’ collaborative learning and self-reflection through instant feedback.

Pioneers in Computer Science

Visit this Wikipedia webpage: http://en.wikipedia.org/wiki/List_of_pioneers_in_computer_science

This article presents a list of individuals who helped in the creation, development and imagining of what computers and electronics could do. Based on your assigned names, summarise these computer science pioneers into the following.

If information is not available in the Wikipedia, it is not necessary to search other websites (unless your choose).

* Required

Gender *

What is the name of the computer scientist? *

Where is he/she originally from? *
e.g. USA, Russia...etc.

Date of Birth
(if available)

What is his/her major in university (undergraduate and postgraduate)?
(If more than one bachelor, master, or doctoral degree, then choose one of his majors)

	Mathematics	Electronic/Electrical Engineering	Physics	Computer Science	Others
Bachelor's Degree	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Master's Degree	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Doctoral Degree (PhD)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Fig. 18.3 Google Drive (form) for submitting computer scientists’ profiles

35 responses

[View all responses](#) [Publish analytics](#)

Summary

Gender



Male	31	88.6%
Female	4	11.4%

What is the name of the computer scientist?

Ramon Llull
Alan Kay
Edmund M. Clarke
Maurice Wilkes
Blaise Pascal
John atanasoff
Edgar F. Codd

Fig. 18.4 Screenshot of result summary in Google Drive (form)—computer scientists' gender and names

18.3.2.4 Introducing Game-Based Coding Tool for Instant Feedback

Kodu Game Lab is a game-based coding application that helps students to understand basic computer programming and coding by creating simple gaming programs (MacLaurin, 2011). The graphical gaming elements and user-friendly interface attract students' interests in game design using computational thinking (see Figs. 18.6 and 18.7). In one of the observed lessons, students worked in small groups to design a simple game using Kodu after the teacher introduced mathematical principles for gaming development. To win the game, the player should use Kodu, the main character in the game, to eat five apples. When each apple was eaten, one mark was scored and shown on the computer screen. A winning screen should be shown to indicate that the goal was accomplished. To motivate students' participation, a competition was organized, in which the winning group were invited to demonstrate how they accomplished the task.

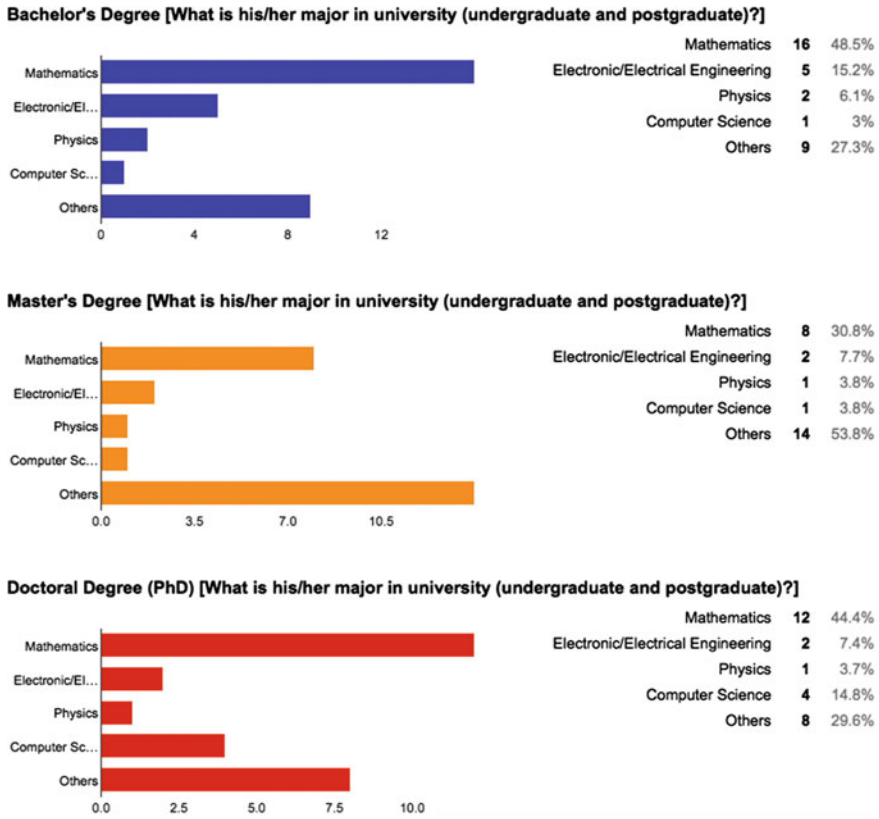


Fig. 18.5 Screenshot of result summary in Google Drive (form)—computer scientists’ educational backgrounds

18.4 Methods

18.4.1 Sampling

All individuals involved in the course, namely the teacher and 15 students enrolled in the course, were included in the sample, giving an intact class group, including the teacher, for in-depth investigation. The participants were asked to give informed consent prior to data collection.



Fig. 18.6 Screenshot of welcoming page in Kodu Game Lab



Fig. 18.7 Screenshot of programming environment in Kodu Game Lab

18.4.2 Data Collection

Two consecutive lessons were chosen for video-recorded classroom observations. The lessons were entitled “Numbers make the nature become alive—Music and mathematics” and “Entertaining encounters in mathematics—Video game and mathematics.” Qualitative data were collected through classroom observations,

Table 18.1 Demographic statistics of qualitative data

Items	Frequency	Percentage
<i>Gender</i>		
Female	9	60.0
Male	6	40.0
Total	15	100.0
<i>Year of study</i>		
1	0	0
2	15	100.0
3	0	0
4+	0	0
Total	15	100.0
<i>Major of study (undergraduate)</i>		
Mathematics education (primary)	10	66.7
Science and Web technology	1	6.7
Psychology	1	6.7
Greater China study	1	6.7
Information and communication technology (secondary)	2	13.2
Total	15	100.0

student focus groups ($n = 15$, 5 students in each of 3 groups), and teacher interview ($n = 1$). The sampling of the students for the focus groups is 100% of the entire enrollment to the course. The basic demographic statistics of the students is provided below in Table 18.1. The number of enrolled students was relatively small, since they comprised the first cohort of the course and students may tend to choose an existing course with good reputation by words of mouth. Although the results reported here are mainly drawn from the interview data, the field notes taken by the researchers (the second author and a research assistant) during the observed lessons helped to triangulate with the interview data, which ensured reliability of findings (Holloway & Wheeler, 2009).

The observations were conducted in the later stage of the course when students were familiarized with the ICT-supported learning tools used in the course. Observations followed a protocol that guided the researcher to observe the physical classroom environment (e.g., seating), the learning atmosphere (e.g., students' attentiveness during tasks), learning and teaching activities, and social interactions between the teacher and students and among students.

The teacher interview and student focus groups followed the same interview protocol and took approximately 1–1.5 h each. These were conducted within one week after the second classroom observation when the participants had fresh memories about what was happening in the observed lessons. The teacher's interview took place after the student focus groups, so that he was able to respond to the summaries of students' views. Special care was taken to disguise all students' names in the focus group summaries (and the full transcripts) to ensure

confidentiality of student data. The questions were adapted to the participants' respective roles as the teacher and students and were adjusted according to their responses during the interviews. The questions included the following:

1. Examples of in-class and online tasks using ICT-supported learning tools;
2. Perceived teacher intention for implementing these in-class and online tasks;
3. Participants' experiences of working through or engaging in these tasks;
4. Participants' experiences of giving, receiving, and/or using feedback related to the tasks; and
5. Perceived influences of feedback on student learning engagement and improvements.

The teacher interview was conducted in English, and the students' focus groups were in Chinese. The interview/focus groups were transcribed word for word in English. To increase validity, member checking was undertaken, which involved all transcripts being e-mailed to the participants to correct any errors they identified (Denzin & Lincoln, 2005).

18.4.3 Data Analysis

Analysis of the four interview transcripts was conducted in a thematic analysis approach (Braun & Clarke, 2006). To enhance the reliability of data analysis, the researchers (the second author and the research assistant) independently coded all transcripts to summarize the main points from each transcript. In coding a transcript, the researchers first summarized the participants' experiences and views as the main points (e.g., the teacher's intention to involve all students in classroom and his intention to enhance their collaborative learning). Then, the researchers further condensed the identified main points into categories (e.g., the teacher's intention to encourage students' engagement in class), with each category illustrated with teacher and/or student quotes. The researchers then compared and contrasted the resulting categories from their independent analysis, and resolved disagreements through discussion. Finally, the categories were synthesised into two main themes related to the key research question, which were then presented to the first author for verification without disclosing the names of students whose quotes were included in the analysis.

Next, the main themes and related teacher and student experiences of giving and receiving feedback via ICT-supported learning tools in the course are presented in relation to relevant research literature.

18.5 Results and Discussion

18.5.1 Theme 1: The Use of Mobile Learning Tools to Facilitate Instant Feedback for Enhanced Classroom Participation and Collaborative Learning

This subsection examines how students were provided with instant feedback through the use of online and mobile learning tools in their in-class individual and group work.

The use of the instant response application Socrative was one way to engage students in class discussions. Two students commented on how their engagement in classroom learning was enhanced as a result of using of Socrative because of the anonymous process of answering questions:

(The teacher) would use the app Socrative for our voting. He would post a question which has a few options; then you do the voting. The result is shown on the screen. No one would know which options that the others have voted for and everyone would participate in the class. This is better than asking a student to answer the question verbally, 'cause no one would volunteer. I think he (the teacher) wanted everyone to be involved in class.

At the beginning of the course, the teacher introduced an app called 'Socrative'. It was used to collect students' opinions via secret ballot. I think it was good, because it encouraged us to join in discussions in class. Hong Kong students are reluctant to answer questions. This app allows you to express your opinion without raising your hand.

From the above quotes, it can be inferred that Socrative offered a practical solution to overcome some students' reluctance to participate in traditional classroom tasks without mobile learning tools. This echoes some researchers' observation that Chinese students in Hong Kong tend to need more encouragement to speak up in class compared with their Western counterparts (Carless, 2011).

Another student mentioned how group work on Google Drive using mobile devices giving students incentives for exploring learning topics:

It was an in-class activity. We came up with the contributions of around 30 mathematicians (to computer science). We summarised their contributions. For example, most scholars of computer science were mathematicians at the beginning (of their career). Such hidden messages were interesting.

In the afore-mentioned examples given by the students on the use of Socrative and Google Drive, students' active engagement in classroom tasks was supported by the social comfort associated with the anonymity afforded by the mobile learning tools, which was a unique finding of the current study. Chinese students are often commented by Western observers to be passive learners who habitually keep silent in classroom activities, though some researchers point out that Chinese students' reluctance to speak up in class is mainly due to their concern over disturbing others if their responses are incorrect (Watkins, 2008). The finding delineated above demonstrates that anonymity associated with the use of ICT encouraged the participating students' sharing of their learning with peers and teacher. Moreover,

the instant feedback stemming from collected responses as a result of students' collaborative effort served as a motivating factor boosting students' learning interest, which echoes Nicol' (2009) finding from first-year undergraduate students.

In short, the theme discussed above demonstrates how mobile learning tools can promote students' active participation and improve collaborative learning in the classroom. The teacher's scaffolding for students' progressive learning was integrated into the design of classroom tasks using mobile learning tools, which assisted in students' understanding about learning topics (Resta & Laferrière, 2007).

18.5.2 Theme 2: The Use of Online Learning Tools to Produce Asynchronous Feedback for Sustained Out-of-Class Teacher–Student and Peer Interactions

In the course, students were regularly invited to post their ideas and reflections on the discussion forum on Moodle, where they were encouraged to comment on peers' contributions. By doing so, students were able to find out what they had or had not learned by comparing their own views with peers' contributions and feedback (Chen et al., 2011). The online interactions therefore allowed students' exchange of diverse ideas and approaches to problems (McNeill et al., 2012), which is illustrated by an example shared by a student:

We had a lesson on films. We watched a film at home and uploaded our reflections on the film to Moodle. The name of the film was Identity Thieves and Three Idiots. We upload our own reflections and commented on other students' reflections. By sharing the reflections, we not only interacted with classmates, but also accessed their opinions. The teacher commented on our work on Moodle in the end.

The teacher also mentioned using students' contributions in the online forum as feedback for himself about students' understanding:

So by talking to them and by asking them to write reflective journals on Moodle, I started to see what they had in their mind. By reading the journals I started to see what they were thinking in their mind.

From the teacher's quote, it can be inferred that the teacher regarded himself as a co-learner who was able to benefit from students' contributions. The teacher also mentioned, "I sent them weekly e-mails based on my own reflection right after the class." The e-mail exchanges with students were intended to provide further learning support for students and to encourage their preparation for the next lessons. The previous research indicates that students value social interactions with teachers and peers outside the classroom, since such interactions give them the crucial cognitive and social support in their learning engagement (McLuckie & Topping, 2004; Merry & Orsmond, 2008). This is echoed by the following student quote:

He would send us an email after each lesson. He would thank us for our participation and it really made us feel we had to participate in class actively... He would say that he could see that we were attentive in class. He would say this to us. He would let us know what topics we would discuss in the next lesson. Those who were absent were informed about the lesson when they received the email. There were encouraging remarks at the end of the email. I think the emails he sent us were quite effective for us.

In the above-mentioned scenarios, students felt mutually engaged with the teacher and fellow students. In turn, the online interactions gave them a sense of being socially related to and cognitively supported by the teacher and others. The asynchronous peer feedback and teacher feedback facilitated through online interactions in the Moodle system facilitated students' learning engagement and improvements, which would have been impossible in traditional classrooms relying solely on face-to-face communication (Hatzipanagos & Warburton, 2009). The out-of-class online interactions increased students' opportunities for obtaining feedback and encouraged their reflections and revisions which, when combined with in-class activities, helped students to constantly improve their learning (Chance et al., 2007).

18.5.3 Theme 3: The Use of Game-Based Learning Tools to Produce Instant Feedback for Peer Interactions

One of the intended course learning outcomes was students' exploration of how mathematics was applied in technology and entertainment in daily life. Classroom tasks employing game-based learning tools, such as Kodu Game Lab, facilitated such exploration. The teacher explained that through personal discovery of subject knowledge, students were motivated in pursuing future learning:

Through exploration, knowledge becomes genuine for students. Discovery stems from students' motivation and it is based on their observation, analysis, experiment, and finally their conclusion that the hypothesis is correct or incorrect. I really want students to gain this kind of (discovered) knowledge rather than being told the knowledge.

The learning process of game-based tasks helped students to perceive knowledge exploration positively:

The course expects us to discover what we encounter in daily life, which involves mathematical theories. Entertainment is one of such encounters.

I have learned about interesting things. I am interested in the topic of being a game developer. I will discover more about this topic in the future.

Compared to the norm of higher education with teachers lecturing in traditional classrooms, the practical hands-on experiences engendered by using affordable game-based tools and multichannel feedback mechanisms were more motivating to students, since learning was playful in this way. Teachers could have been presenting and demonstrating the principles of gaming with mathematical concepts,

which may have limited students' exposure to the tools. In our case, giving feedback via digital learning games facilitated students' deep engagement with mathematical concepts underlying the games, bringing more learning benefits than conventional didactic teaching (Erhel & Jamet, 2013).

Previous research indicates that game-based learning affords instant feedback (e.g., Charles, Charles, McNeill, Bustard, & Black, 2011; Domínguez et al., 2013; Kiili, 2005). In their small group task of using Kodu to design a simple game, instant feedback was facilitated by the game design system, which helped students to self-check the design requirements to determine whether their game operated as expected. The self-checking, in turn, facilitated students' self-feedback and critical self-reflection on their game design. The competition between groups encouraged students' sharing of ideas with group members in setting game rules. Following the competition, the winning group shared their approach to designing the game, which served as peer feedback for classmates. The interplay between the instant feedback facilitated by Kodu Game Lab and students' self-feedback and peer feedback thus contributed to their learning engagement and improvements. In this way, the students were actively engaged in collaborative knowledge building, and their ability to make critical judgment and self-improvement on their own work was enhanced. As the teacher commented:

Students can work together and learn from peers rather than relying on the teacher. Some students may not consider themselves as experts; they may think the teacher is the only person in the classroom who can present knowledge. But I think every student has something to contribute.

In short, the use of game-based learning tools, such as Kodu Game Lab, was an effective means to facilitate feedback from multiple sources, including the game design system (instant feedback), students themselves (self-feedback), and other students (peer feedback). The dialogic feedback process, in turn, helped students to explore and discover knowledge related to the subject matter, thus contributing to their collaborative knowledge building. If the game-based learning approach is carefully designed, it can benefit learners of different ages through game-based feedback (Papastergiou, 2009; Sung & Hwang, 2013).

18.6 Conclusions

The current chapter examines a case study of our own classroom in relation to the use of ICT to support students' learning engagement and improvements. The findings provided evidence that the use of online, mobile, and game-based learning tools supported the teacher's intention to provide students with cognitive and social support through meaningful feedback dialogues. The findings further demonstrate that these affordances were achieved through appropriate task design and deployment of both instant and asynchronous feedbacks. By using online, mobile, and game-based learning tools, the teacher was able to extend the process of giving,

receiving, and responding to feedback outside the classroom (Wong, 2014). The findings also indicate that when the teacher listened to and acknowledged students' voices, the feedback process became mutually engaging for the teacher and students as co-learners in knowledge building (Nolen, 1994). Above all, the positive effects of student learning with the new mode of ICT interventions are identified based on the findings from students' voice. Indeed, the students found that the interventions with ICT to provide them with feedback were interesting, engaging, motivating, and encouraging. Nevertheless, more research has yet to be done to study further how new technological interventions can continue to improve students' learning in higher education.

Our case study demonstrates how the student learning is facilitated through interventions using ICT, which is the primary goal of SoLT. The positive effects are observed and found through students' sharing of experience both inside and outside the classroom. The ICT platforms afford students and teachers a new dialogic channel for feedback exchange and communication, and indeed, it is the nature of ICT to communicate and handle digital information for knowledge creation, dissemination, storage, and management (Tinio, 2003). Although students can gain benefit from individual teachers with ICT interventions, the institution by and large could unify and maximize the experience of student learning with knowledge transfer among teachers through SoLT. Collection of helpful mobile apps for feedback exchange as well as other technological teaching aids may be suggested by the institution for teachers to try and use. In higher education, particularly, we can enlighten the technological and pedagogical design among colleagues with evidence from the voice of students by sharing the findings within and outside the institutions publicly. This sharing of practice may intuitively and practically benefit students' learning experience when instructors of other courses apply a similar design in his/her classroom.

With the increasing popularity of networking technology, the use of ICT-supported learning tools is becoming more common in higher education classrooms and their role in feedback provision should be emphasized by teachers and institutions in learning and teaching enhancement (Trenholm, Alcock, & Robinson, 2015). Sherman and Kurshan (2005) suggest that feedback supported by ICT is time-efficient and can focus students' attention on their learning at the moment. To sustain feedback dialogues both inside and outside the classrooms, it is imperative to examine how different types of advanced software applications may be deployed to facilitate instant and asynchronous feedback. The present study is a useful attempt to achieve this goal. Future research may investigate how ICT-supported feedback can be used alongside immediate feedback during face-to-face class time and out-of-class consultations to provide supportive scaffolds for students' ongoing learning progress and improved performance. While feedback strategies integrated into the use of LMSs have attracted considerable research effort (Gikandi et al., 2011), further investigations into other ICT-supported learning tools in making feedback and learning engaging and time-efficient for students and teachers will be desirable in order to advance this promising area of research forward.

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Chapter 19

Using Feedback Strategies to Support First-Year Students' Independent Learning and Critical Judgment

Theodore Tai Hoi Lee and Min Yang

Abstract Internationally, independent learning and critical judgment are regarded as key attributes that undergraduate students should develop in academic learning. Existing research has, however, evidenced the first year at university as a period of academic transition during which students need extensive support. This chapter explores the research question: How can feedback strategies be implemented to support first-year students' independent learning and critical judgment? Drawing on the research literature, principles of pedagogy to support first-year students' independent learning and critical judgment are proposed. The chapter reports a case study in which first-year students were provided with feedback through tutorial lessons of a General Education Foundation Course. Qualitative data were collected via two class observations, a teacher interview, and two focus groups. Findings suggest that the incorporation of feedback strategies into pedagogical design was the key to support first-year students' independence and criticality in academic learning. Findings highlight the importance of pedagogical and feedback design in supporting first-year students' learning: (a) constructing a structured tutorial framework to scaffold independent learning; (b) using active learning tasks to involve students in critical thinking and reflection; (c) employing teacher feedback to construct a supportive learning climate; and (d) using peer learning and peer feedback to develop critical judgment. The chapter concludes by drawing implications from the findings for supporting first-year students' learning, with particular attention to engaging East Asian students in active participation in classrooms as safe and trusting learning communities.

Keywords First-year students • Feedback strategies • Teacher feedback • Peer learning • Peer feedback

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19.1 Introduction

Internationally, the capabilities of independent learning and critical judgment are regarded as two essential attributes that undergraduate students should develop in an age of knowledge economy (Barnett, 2004; Kantar, 2014; Knight, 2006; McNeill, Gosper, & Jing, 2012). Individuals need to engage in independent learning in the workplace in order to set learning objectives for gaining knowledge and skills to meet new demands of work. As a regular part of their professional jobs, individuals also need to make critical judgements about their own and others' work. These two capabilities are interrelated in that only when students are equipped with the capability for making critical judgment (e.g., strengths and weaknesses of one's work) can they act as independent learners who make informed decisions about their own learning (e.g., where to put more effort in next steps) (Clark, 2012; Sadler, 2010). Hence, it rests on higher education teachers to facilitate undergraduate students' development of these core capabilities through the design and implementation of appropriate teaching and assessment (Crisp, 2012; McNeill, et al., 2012).

To achieve teaching excellence which is key to higher education teachers' capacity for designing enhanced learning experience to improve students' learning, it is necessary for teachers to engage in professional development opportunities through Scholarship of Learning and Teaching (SoLT, see the introductory chapter of this book). By pursuing SoLT activities through inquiry, reflection, and dissemination of research findings on learning and teaching, such as the pedagogical practices discussed in this chapter, teachers can make long-lasting impact on students' learning (Vardi & Quin, 2011).

Existing research indicates that first-year students experience a challenging period of academic transition as they move from secondary school to higher education. The increased demand on first-year students to demonstrate independent learning and related academic skills (e.g., setting short- and long-term learning goals, allocating relevant learning materials, and time-management) leads to their need for extensive learning support (Ballinger, 2003; Pitkethly & Prosser, 2001).

Empirical studies conducted by researchers in the West show that difficulties in academic transition result in some students' withdrawal from higher education (Yorke & Longden, 2004). In the East where retention is not a serious problem, challenges in students' induction to academic skills have been reported (Yang, Webster, & Prosser, 2011). One of the purposes of this chapter is therefore to offer insights into the provision of learning support for first-year students in the context of Hong Kong, an East Asian society where the learning culture at school and in higher education has been shaped, at least in part, by the Confucian culture (Brown & Wang, 2013; Carless, 2011).

SoLT highlights the use of alternative forms of formative assessment as support for students learning. One form of learning support for first-year students is the teachers' feedback that facilitates students' regular learning progression and inducts them to the habits of thinking independently and reflecting critically about subject matter (Nicol, 2009; Rolfe, 2011). The current chapter is particularly concerned

with the integration of feedback strategies into the pedagogical design of undergraduate courses with a view to helping first-year students to develop independence and criticality in academic learning.

This chapter sets out to explore the research question: How can feedback strategies be implemented to support first-year students' independent learning and critical judgment? Specifically, it reports a case study in which first-year students were provided with formative feedback through tutorial lessons of a General Studies Foundation Course. Qualitative data were collected via two class observations, a tutor interview, and two focus groups. By examining the role of feedback in scaffolding students' progressive development of the capabilities of independent learning and critical judgment, the findings illuminate specific issues related to the deployment of use of teacher feedback and peer feedback within a purposefully structured tutorial lesson framework. Implications are drawn for teachers, administrators, and researchers in higher education who aim to develop sustainable learning support for first-year students through the use of feedback strategies as an integral part of the pedagogical design of academic courses.

19.2 Pedagogical Principles to Support First-Year Students' Independent Learning and Critical Judgment

The research literature reveals mal-alignment between first-year students' demand for learning support and the teacher guidance and feedback that they receive (Orsmond & Merry, 2011). In a qualitative study on the feedback experiences of 23 staff and 145 students in six schools and three English universities, for example, Beaumont, O'Doherty, and Shannon (2011) found notable differences between the teacher feedback and support that students received at senior secondary school and at university. While students were provided with regular formative feedback and suggestions at secondary school, the feedbacks they received at university were mostly summative judgments on their end-of-semester assignments. Beaumont and associates' (2011) findings resonate with Price and associates' (2011) observation that while the university students in their study were frustrated by inadequate teacher feedback to help them improve performance in assessments, their teachers also felt discouraged by the little attention that students paid to feedback commentaries on assignments.

Adding to this perplexing picture of the gap in teachers' and students' experiences of feedback is the research evidence on differences between teachers' and students' views about the quality and quantity of feedback, with teachers reporting more positive perceptions about their feedback provision while students being less satisfied with this aspect of their programs (Bailey & Garner, 2010; Carless, 2006; Watty et al., 2013). The feedback gap delineated above calls for higher education teachers' and administrators' attention to the need to formulate suitable feedback

strategies to support first-year students' adaptation to university learning (Beaumont, et al., 2011; Rolfe, 2011).

Researchers have stressed both the evaluative and formative roles of feedback. Whereas feedback should inform students on the distance between their current and expected levels of understanding, it should also help students shorten the distance by equipping them with skills and strategies to make improvements (Sadler, 2013). One of the reasons giving rise to the feedback gap is certain teachers' and institutions' insufficient attention to the formative role of feedback, as suggested by Li and De Luca's (2014) review of assessment feedback research. Past studies have evidenced the positive effects of feedback strategies on students' academic performance (Evans, 2013). Examples of feedback strategies include self-assessment, peer assessment, multi-stage assignments, and exemplars illustrating different levels of assessment performance. A common feature of such strategies is the emphasis on inducting students to expected learning outcomes and assessment standards as the learning goals of their course or program. Implementing appropriate feedback strategies thus fulfills the goal to facilitate students in critically evaluating their own work and peers' learning, which in turn helps them gain independence as learners in their subject areas.

Previous studies also highlight the social aspect of feedback. Viewing feedback as an interactive endeavor is supported by empirical findings from studies reporting the positive effects of teacher–student on students' study motivation (Boekaerts, 2010; Meyer & Turner, 2002). The social aspect of feedback is reflected by findings from investigations into the role of peer interactions in students' reflective knowledge building (Roscoe & Chi, 2008; Twiner, Littleton, Coffin, & Whitelock, 2014) and their capability to make critical judgment about their own and peers' work against assessment criteria and standards (Falchikov, 2007; Sadler, 2010).

In this chapter, Gibbs and Simpson's (2004) "conditions under which assessment supports students' learning" are adapted into a set of eight principles of pedagogy to support first-year students' independent learning and critical judgment. Gibbs and Simpson's (2004) first three conditions are adapted as principles for analyzing the classroom learning tasks in the case study, while the Conditions 6, 9, and 10 are combined into Principle 4.

Principle 1. Learning tasks in the course capture sufficient study time

Principle 2. The tasks engage students with important aspects of the course

Principle 3. The tasks orient students to productive learning activities

Principle 4. Sufficient, detailed, and timely feedback is provided, so that it is attended to and acted upon by students

Principle 5. The feedback focuses on students' learning and performance

Principle 6. Feedback is appropriate to the learning goals (criteria and standards) reflected by the assessment tasks

Principle 7. Feedback is appropriate to students' experiences and understanding of assessment and learning

These principles echo current understanding in the research literature regarding the role of feedback in cultivating students as self-regulated learners while giving them sufficient guidance in order to achieve learning goals (Clark, 2012). To the above list another principle may be added, the rationale being the need to engage students with peers in the feedback process as discussed in the preceding paragraphs.

Principle 8.

Feedback involves students' contribution to peers' learning

It should be cautioned that to make these principles work for first-year students (and senior-year students), the learning goals need to be negotiated through teacher–student and peer interactions to reach a common understanding about desired learning outcomes and standards (Millar, 2013). This can be done through group and whole-class discussions of exemplars, collective feedback on students' ongoing learning and assessment tasks before submission, and consultation sessions on students' draft assignments. In doing so, students are enabled to gain a sense of independence as well as ownership of the learning and assessment processes (Yang & Carless, 2013). Vermunt and Verloop (1999) suggest maintaining a careful balance between teacher guidance and student independence because of first-year students' need for teacher support of scaffolding their learning progression and making critical judgments about the quality of their work. How the above principles may be implemented in the context of supporting first-year students' independent learning and critical judgment is examined by exploring qualitative data of the case study being reported in this chapter.

19.3 Methods

In the case study, qualitative data were obtained via two classroom observations of tutorial lessons, a tutor interview, and two focus groups with first-year students in a tutorial group of the General Education (GE) Foundation Course. A detailed description of the course background and its pedagogical and feedback design is presented in Sect. 4—The case study.

All 20 students in the tutorial group and the tutor were included in the sample. Informal consents from the class were given to all participants prior to the classroom observations ($n = 21$), while individual consent was collected from individual participants for the individual interview with the tutor ($n = 1$) and focus groups with students ($n = 4$; two students in each group).

19.3.1 Data Collection

The classroom observations were conducted in two tutorial lessons by making video recordings of learning activities and interactions in the classroom. Field notes were taken about the activities, interactions, and the learning atmosphere during the observed lessons; selected classroom conversations (e.g., whole-class discussions and students' oral presentations on small group tasks) were transcribed verbatim for subsequent data analysis.

The tutor's interview and students' focus groups were conducted soon after the second observed lesson to obtain their authentic narratives. The tutor was asked about the course background, his reasons for arranging learning tasks and giving guidelines and feedback, and perception of students' participation in the tasks. The students were asked about their experiences of taking part in the tasks and giving, receiving, and using feedback on tasks, as well as the extent to which the feedback was helpful for improving performance in assessments. The interview and focus groups were audio-recorded, transcribed verbatim, and sent to the participants for member-checking to ensure the quality of data (Patton, 2002).

19.3.2 Data Analysis

The classroom observation notes and transcripts of the interview and focus groups were analyzed through data reduction (Miles & Huberman, 1994). After summarizing the key points of the field notes and transcripts, the key points were further condensed into categories of meanings shared by the participants, with each category being illustrated by selected quotes from participants. The categories from the whole data set were then put together by combining similar categories and eliminating those that were irrelevant to the research question. Finally, broad themes were derived by summarizing the categories. In the Findings section, the themes are presented as subheadings, with the tutor's and the students' experiences in the course being delineated and supported by their narratives.

19.4 The Case Study

This section discusses the course background being studied in the case study as well as its pedagogic and feedback design for the provision of sustained learning support for first-year students in the course.

19.4.1 The Course Being Studied

This chapter examines findings from a case study of a GE Foundation Course taught by the first author to a tutorial class group of 20 students over the two semesters of their first-year undergraduate studies. In the tutorial group, the tutor organized classroom tasks designed with active learning pedagogies, which aimed to nurture students' capabilities of independent learning and critical judgment. The GE Foundation Course was a compulsory breadth course offered to all first-year undergraduate students in the institution under study. In their weekly lectures and tutorials that were structured with a thematic approach, the students were guided to construct knowledge related to a scope of themes derived from different subject fields. Explicated by the speakers and tutors from philosophical, sociopolitical, and empirical perspectives, such themes exposed the students to complexities of ideologies and persistence of ideological tensions in society. Following the weekly lectures that students took alongside other tutorial groups, the students then attended tutorial sessions in their own classroom. Learning activities in the tutorials typically consisted of individual and small group tasks, and whole-class discussions.

The students were expected to demonstrate appropriate levels of understanding about the core concepts and perspectives learned in the course. They were also required to think, discuss, and write critically about key issues raised in the course in order to meaningfully relate learning in the course to personal beliefs, values, and goals. To demonstrate these expected learning outcomes in the assessments, the students were required to: (1) submit a reflective e-journal to Mahara (an online-learning management system) after each lecture as an ongoing assignment; and (2) submit an individual essay and conduct a group presentation on core themes of the course as end-of-semester assessments.

19.4.2 The Tutorial Lessons

Previous research indicates the development of critical thinking, reflection, and argumentation skills to be crucial for students' higher-order learning outcomes (Collins, 2014; Fischer, Bol, & Pribesh, 2011). The major objective of the tutorial lessons in the case study was to assist in students' development of such skills. In the first semester of the course, students were guided to attempt using these key learning skills, which ranged from comparing multiple perspectives, through identifying and synthesizing evidence and using it to construct arguments, to integrating arguments with personal experiences/views. In the second semester, students practiced applying the skills by discussing key concepts, themes, and issues learned in the course.

The tutor established a structured framework of tutorial design, so that students' learning activities proceeded in a coherent and steadily paced fashion to meet

learning challenges. The tutorial framework consisted of three parts. In the first part of each tutorial, small groups of students were facilitated by the tutor to conduct in a review of contents in the preceding lecture using a set of review questions. The questions required students to identify and reorganize key concepts and issues, related information or facts, and major arguments conveyed in the lecture.

The second part of the lesson is comprised of the tutor's provision of verbal feedback on students' e-journals. Selected entries from e-journals downloaded from students' submissions to Mahara were presented on the lecture room screen. The tutor's feedback comments were given anonymously, highlighting the aspects in the e-journal entries needing students' attention. Emphasis was placed on how students might construct meaningful linkages between the concepts, issues, and facts to students' prior knowledge, experiences, and reflections. Students were invited to share additional comments or alternative ideas on the displayed e-journal entries. Previous research indicates that such public display of students' work can assist in their improvements by enabling them to critically reflect on fellow students' understanding and approaches to tasks (Carless, Salter, Yang, & Lam, 2011).

The third part of the tutorial lesson included interactive learning tasks adopting active learning pedagogies, such as role plays, mobile games, and debates. Previous studies have generally supported the positive effects of active learning pedagogies on students' learning and performance (Bakır, 2011; Gholami, Moghaddam, & Attaran, 2014). Similar to activities in the first and second parts, these tasks helped students to practice critical thinking, argumentation, and reflection skills. In the tasks, students were facilitated to discuss the key concepts/ideas and report their responses to the whole class, with verbal feedback comments given by the tutor and other students.

19.5 Findings

Based on the qualitative data, four major themes on the pedagogical design to support first-year students' independent learning and critical judgement emerged from the case study.

19.5.1 Constructing a Structured Tutorial Framework to Scaffold First-Year Students' Skills for Independent Learning

To reiterate, an essential requirement of undergraduate studies is demonstrating appropriate academic skills in learning and assessment tasks, which bring about considerable challenges for the first-year students (Ballinger 2003). The structured tutorial framework was regarded by the first-year students to be indispensable in

scaffolding their development of such skills, which gradually facilitated them to become capable of independent learning.

In the first part of each tutorial, namely the lecture review, the students were guided to explore the various aspects of the learning materials delivered in the lecture. The students were guided by the review questions to reorganize the materials and build linkages among the concepts, facts, and related issues. The tutor explained:

At the beginning of the tutorial I would ask the students to restate what the speaker mentioned in the lecture. This was for them to give a description (of the message). Through the description, they had to express the key message explicitly... Gradually, they could identify the facts and give their own interpretation. Interpretation is a kind of elaboration; before that, they need to give a good description.

In the second part of the tutorial, the tutor gave verbal feedback on extracts of students' weekly e-journals, which showed their reflections about lecture themes. The tutor would demonstrate to students the ways of identifying different perspectives on the themes and challenging such perspectives in order to nurture their sensitivity for engaging in critical reflection. As the tutor explained:

The feedback of e-journal was normally presented as questions. The questions provoked their thinking, such as, "Am I thinking on the right track?" "Is it the right direction?" "How do I think further?"

In the third part of the tutorial, students were given tasks requiring them to think critically about the ideas or issues learned in the lecture and tutorial, and construct arguments by reflecting on different perspectives on the ideas. Students' responses to the tutorial activities were positive, as the students commented:

I think the way the tutor taught us has motivated us to learn.

This course served as a bridge for us to transit from a secondary student to a university student. In the past, we just put all the knowledge and exam materials into our brains without truly understanding their meaning. We are now encouraged to gain deep understanding.

19.5.2 Using Active Learning Tasks to Involve Students in Critical Thinking and Reflection

Diverse activities were used to engage the students in exploring learning topics in the tutorial lessons. In one of the observed lessons, the students were asked to conduct a debate by taking two sides holding different views on the topic "The chief executive in Hong Kong should be elected by universal suffrage." Prior to the debate, students reviewed materials about different perspectives on democracy in Hong Kong. In the debate, they were asked to employ these perspectives in relation to personal knowledge and experiences. A student commented:

I like the debate activity. After the debate the tutor pinpointed the important ideas that we suggested and concluded with a set of arguments.

In another lesson, the concept of “executive functioning” was introduced to help students explore the issue of poverty in Hong Kong discussed in the lecture. The students were given 5 min to play a mobile game, Train Conductor 2. The game simulated the condition in which individuals were deprived of adequate resources for making effective decisions in life, which assisted in students’ understanding of the concept.

On the surface the activity was not related to poverty. In fact, it was about life opportunities, the way we think and work, and how we make decisions.

Like the other tasks, the game activity elicited students’ prior knowledge (i.e., life experiences of democracy) and personal experiences (i.e., difficulties in learning to play an unfamiliar game), which aided in their discussion of the issues and concepts in a critical and reflective manner. Students were aware that learning in this way was helpful in their improvement of performance in assessments.

He [the tutor] wanted us to apply what we have learned. And he wanted us to think critically about the issues we discussed.

The best part of the tutorials is that he taught us how to build the linkage of the topics. Once we are able to establish the linkage, we can write a persuasive essay. I believe it’s an important part of my university learning.

The tasks also served to stimulate students’ interests and cater to their abilities, making the classroom activities relevant and meaningful for students’ learning.

The classroom activities were diverse, including games, discussions and debates. This is a good way of teaching that should be retained for the next cohort.

I think through group activities, the tutor could better cater for students’ needs and understand the abilities of different students.

19.5.3 Employing Frequent Teacher Feedback to Construct a Supportive Learning Climate

The tutor created a safe and trusting atmosphere in the tutorial lessons. This was achieved by showing respect for students’ privacy when giving feedback and using positive comments to encourage active participation in classroom discussions. In this way, students were encouraged to learn from errors.

Our ideas may not be complete. The tutor would point out the errors without disclosing our names.

The tutor gave us a great deal of freedom to think. He praised us when we raised some good points. When we had doubts, he was willing to help us clarify our ideas by giving more examples.

As commented by students, by showing appreciation of students' own ideas the tutor was able to help students gain a sense of ownership of classroom discussions.

Our tutor would not judge what we said in the discussions. Instead, he would offer a different prospective and take us to the right track of thinking. Although he guided us to think, he would not control what we had to think about.

Tutor feedback was also used to stimulate students' critical thinking and reflection. For example, in giving feedback on students' e-journals, the tutor modeled effective ways of interpreting the core concepts and issues from different perspectives, and suggested strategies for improving students' expressions in the writing.

Our tutor would review our e-journals and explore the various ideas raised by our classmates, which triggered our interest in the topics. In this way, we can also get to know what the other students think.

19.5.4 Using Peer Learning and Peer Feedback to Develop Critical Judgment

In the tutorial lessons, peer interactions were regularly employed to engage students in deep, critical, and reflective thinking. He utilized peer feedback to encourage active peer dialogues in small group tasks. As a student remarked:

Each group may have their own ideas. We [the small groups] would gather all the ideas at the end of the lesson and draw a conclusion. In this way, we can gain a deeper understanding and broaden our perspectives.

The students were encouraged to give feedback to the presentation of other groups so as to extend the group discussion. The students found such exchange of feedback comments helpful to their learning.

Sometimes my classmates can think of some ideas that I may have overlooked. In this way, we can exchange the ideas among ourselves. And this is very important because learning is two-way but not only individual matter. Learning from each other can facilitate improvement.

Students' contribution to peer feedback on assessment tasks was also encouraged. For example, following the tutor feedback on the selected e-journal entries, students were invited to make additional comments or raise questions. Such peer-feedback comments were appreciated and readily understood by those who were the writers of the e-journals. At the end of the semester when students conducted group presentations for final assessment, each presenting group received written peer reviews from other groups, which were acted upon by students in composing their final group reports. It may be inferred that students' capability of critical judgment was cultivated through the classroom interactions, in which peer learning and peer feedback were an integral part.

After studying this course, our horizons are widened because actually we can now use different perspectives to look at things.

19.6 Discussion and Conclusion

This chapter intends to broaden the conceptualization of learning and teaching in SoLT by exploring issues related to the pedagogical design in academic courses to support first-year students' development of the capabilities of independent learning and critical judgment. Based on the findings of the case study, four implications that can be drawn in relation to designing and deploying appropriate pedagogy to support first-year students' learning are now discussed.

First, teachers should be empathetic about first-year students' learning needs and challenges associated with the transition from secondary school learning to undergraduate studies. Apart from inducting the students to relevant subject issues in their academic courses, they should also be required to develop appropriate learning skills and thinking habits. The case study shows that a clear framework of lesson design can help the students manage the expectations of their learning outcomes in the course. As the elements of independent learning were deliberately employed in the learning tasks, the students were supported to master the skills and habits of making arguments in a disciplined fashion. This echoes McNeill and associates' (2012) argument for the need to choose suitable learning and assessment tasks in order to orient students' learning to higher-order learning outcomes.

Second, students who originate from East Asian societies are portrayed in the literature as being reluctant to join classroom conversations and are even characterized as passive learners, possibly due to social norms of the traditional Confucian culture requiring students to obey and respect authoritative figures such as teachers (Carless, 2011). Such characteristics are regarded as impeding formative assessment and feedback strategies to take effect in Eastern Asian classrooms (Thanh Pham & Renshaw, 2015). Nonetheless, the findings of this study provide counter-evidence by showing that when prompted with appropriate guiding questions and afforded a safe and trusting atmosphere, East Asian students can be encouraged to engage actively in thinking and discussing in classrooms (c.f. Chan, 2009). Being able to contribute to classroom learning can, in turn, help students to gain a sense of belonging to their learning communities (Fox, Stevenson, Connelly, Duff, & Dunlop, 2010). As previous studies indicate, students' learning communities can be established when first-year students enroll in courses such as the GE Foundation Course being reported here, which offer them common learning experiences for developing essential learning skills and thinking habits as well as building support networks comprised of their teachers and peers (Pitkethly & Prosser, 2001).

Third, the study shows that immediate feedback for the students on their performance help them consolidate their efforts and internalize the skills as a learning habit. The design of learning tasks should be purposely allowing the students to

express different views and opinions. The feedback should then be focused and elaborated to highlight students' contribution so as to build their confidence on constructing their own ideas and arguments. By encouraging first-year students' increasing self-confidence in demonstrating their understanding about learning topics, students were enabled to move toward independent learning. As students gradually develop their learning skills and strategies, the tasks can be increasingly difficult, so that they can be expected to accomplish more complex learning goals (Knight, 2006).

A fourth implication is that feedback can be an interactive endeavor in students' everyday learning process. The findings show that the students' learning was facilitated by peer interactions and reviews during the tutorial lessons. To develop their complex judgement, peer conversations either in small groups or in whole-class situation acted as peer-feedback loops that stimulated and challenged them to critically discuss and reflect on learning topics. In such peer-feedback loops initiated and acted upon by students and their peers, the first-year students were mutually engaged in the acts of offering, discussing and commenting on peers' ideas which broadened their perspectives (Nicol & Boyle, 2003). To further extend such peer-feedback loops, the teacher's role was important in that by posing challenging questions to invoke deep understanding about the topics, the cognitive demand of classroom discussions was maintained at a suitable level (Vermunt & Verloop, 1999). Since the feedback comments were given at the very moments when their learning tasks and assessment tasks were being undertaken, students were provided with as well as contributed to immediate, specific, and constructive feedback that they acted upon almost immediately, generating a sustainable feedback cycle for constant improvements.

To conclude, the findings reported here indicate that the eight principles of pedagogy, which are adapted from Gibbs and Simpson's (2004) work, are suitable to support first-year students in developing their capabilities of independent learning and critical judgment. In managing the transition from secondary school to university, first-year students need extensive support in academic and social aspects of their undergraduate studies. As students' learning and performance can be limited by the exposure to different concepts and a narrow perspective, the case study shows that providing appropriate feedback can help broaden students' understanding of concepts and enhance performance (Hattie & Timperley, 2007). Meaningful learning tasks combined with sufficient, detailed, and timely feedback for first-year students may guide them to make smooth transition (Beaumont, et al., 2011) and help them develop skills and habits needed for becoming independent learners (Boud & Molloy, 2012).

Although the case study shows that the first-year students in the GE Foundation Course responded positively to the structured tutorial framework and the formative feedback strategies, its findings are not intended for generalization to the wider context of higher education. The value of the case study lies in the insights into the provision of learning support for first-year students' academic transition through appropriate pedagogical and feedback design. Future research may produce further evidence on the impacts of formative feedback strategies as well as refine the

principles of pedagogical and feedback design with the view to promoting first-year students' independent learning and critical judgement as proposed in the current chapter.

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Chapter 20

Embedding Feedback in Learning and Assessment Tasks to Support Students' Professional Learning

Christina Chung-Wai Han and Min Yang

Abstract Professional learning involves inducting students to disciplinary substance and engaging them with peers and teachers to practice disciplinary norms. Compared with traditional didactic teaching, active learning pedagogies are more suited to engendering interactive classroom dynamics that are conducive to quality learning outcomes. There also exists the need to support students' attainment of professional learning goals through appropriate assessment design. This chapter explores how students' professional learning may be supported by incorporating feedback strategies into classroom learning and teaching situations and the assessment process. The chapter examines the research question: *How does feedback embedded in learning and assessment tasks support professional learning?* Situated in a course on preschool management for students in a higher diploma teacher education program, the study involved two classroom observations, a focus group with students and an interview with the course teacher. The findings revealed three interrelated pedagogical strategies that supported students' professional learning: (1) using *active learning tasks* to provide opportunities for students to exercise professional knowledge and skills; (2) implementing *integrated assessment tasks* to allow students consolidate and demonstrate increasingly complex learning outcomes; (3) adopting *interactive feedback strategies* to facilitate students' improvements in different phases of learning. Related to these pedagogical strategies, five main themes that emerged from the findings are critically examined, and recommendations are made for teachers in professional fields in higher education regarding the use of optimal feedback strategies to support students' professional learning.

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Keywords Feedback strategies · Professional learning · Active learning pedagogy · Learning tasks · Assessment tasks

20.1 Introduction

Past research reveals the vital role of feedback in helping higher education students to achieve the learning goals of their courses and programs (Yorke, 2003). As one of the most important formative assessment strategies (see Chap. 16 for a comprehensive overview of formative assessment strategies), feedback supports students' learning when it scaffolds their acquisition of knowledge and skills and informs their actions for making continuous improvements (McCune & Hounsell, 2005). To play such a facilitative role, feedback needs to be embedded in learning and assessment tasks as an integral part of students' learning experience. Although previous studies have concentrated largely on how feedback can help students improve assessment performance (Black & McCormick, 2010), in recent years researchers are moving the field further by exploring teachers' approaches to embedding feedback in everyday learning and teaching situations (Evans, 2013). In such interactive classroom situations, students play an active part in generating, receiving, and acting on recurring feedback. By engaging students in an ongoing interactive feedback process, teachers can enable students to take self-responsibility in closing the gap between their actual and desired understanding (McArthur & Huxham, 2013).

Existing research provides evidence on the effects of students' involvement in the feedback process (Callingham, 2008; Gikandi, Morrow, & Davis, 2011), especially when classroom pedagogies support students' knowledge building with peers and teachers in a community of learners (Zhao & Kuh, 2004). When teachers' feedback practices are oriented to desirable learning outcomes and implemented with sufficient teacher support, students show improvements in performance and enhanced motivation for undertaking learning and assessment tasks (Zhang, Lundeberg, & Eberhardt, 2010).

There exist, however, potential challenges for teachers in rendering the classroom feedback process interactive and engaging for students. Apart from traditional teacher-dominated didactic teaching that still prevails in much of classroom learning and teaching in different higher education contexts (Chen, 2014; Kinchin, Lygo-Baker, & Hay, 2008), there is also a tendency in assessment policy and practice, including quality assurance procedures, to treat feedback as only related to summative assessment regardless of students' need for continuous teacher support (Boud & Molloy, 2012). Lacking sufficient teacher support via feedback may cause certain students' disaffection in their undergraduate learning experience and deprive them of opportunities for attaining quality learning outcomes (Watty et al., 2013). Teachers can address such potential challenges by engaging in reflective practices and scholarship of learning and teaching activities, such as conducting investigations

into students' learning experiences and using students' feedback in pedagogical enhancements (Yang, 2015).

This chapter reports a case study on teacher practice of embedding feedback in learning and assessment tasks to support students' achievement of professional learning goals. The chapter addresses the research question: *How does feedback embedded in learning and assessment tasks support professional learning?* The case study is situated in a preschool management course of a higher diploma teacher education program, which was offered to full-time pre-service student teachers at a higher education institution in Hong Kong. Qualitative data were obtained via classroom observations of an interactive lecture session and a student group presentation session, a focus group with students, and a teacher interview. Based on the findings, three interrelated pedagogical strategies for promoting interactive feedback to support students' professional learning goals were examined along with four major themes related to the use of feedback strategies to support students' professional learning. These emerging themes give rise to a set of five recommendations regarding how professional educators can sustain an interactive feedback process in higher education classrooms, which are presented as part of the conclusion.

The case study reported in this chapter fulfills the major goal of this book (see the Introductory chapter), which is to orient the scholarship of learning and teaching (SoLT) to the support of student learning. Part of the case study consisted of a lesson that was open to all teachers at the institution, which was engaged by the teacher in response to the institution's initiative of promoting SoLT among higher education teachers.

20.2 Active Learning Pedagogies and Professional Learning

Existing research reports an array of active learning pedagogies (Bakır, 2011), or what Prince and Felder (2007) call inductive teaching and learning strategies. Tasks employing such pedagogies may range from tasks lasting for a few minutes or slightly longer, such as role plays and case studies that simulate workplace situations, 1-min paper requiring the summary of learning of at the end of a class session, through tasks requiring students' effort over one or more weeks or a semester, such as mini research or design projects (Yang, 2015). Active learning pedagogies promote productive learning behaviors, such as seeking coherent understanding and applying problem-solving skills in professional contexts, as well as encourage students' engagement with peers and teachers in knowledge building (Gholami, Moghaddam, & Attaran, 2014).

Past studies provide evidence that active learning is related to enhanced abilities of critical or creative thinking, problem solving, reflection, and communication (Bakır, 2011; Kember & Leung, 2005). Mixed findings are, however, reported on

the relationship between active learning experiences and academic performance, probably due to the mismatch between standardized tests used to gauge student performance and the kinds of student outcomes being promoted by active learning pedagogies (Michael, 2006; Prince & Felder, 2006).

While teachers may set either individual or group-based tasks, students benefit from collaborative tasks because of the social support offered by peers, which is important when tackling challenging tasks (Litmanen, Lonka, Inkinen, Lipponen, & Hakkarainen, 2012). Past studies have demonstrated the cognitive gains for students when engaged in peer learning and peer tutoring (Fox, Stevenson, Connelly, Duff, & Dunlop, 2010), and peer feedback or assessment (Falchikov, 2007). These peer processes necessitate students listening to and critically evaluating peers' ideas, making their own ideas and thinking explicit to peers, and negotiating for common understanding (Chin, 2006; Roscoe & Chi, 2007).

Teacher education shares a common educational goal with other professional education fields, namely promoting students' development of knowledge and skills as emerging participants of their chosen profession. Coffey, Hammer, Levin and Grant (2011) study suggests that an important facet of learning is students' engagement with disciplinary substance—theories and concepts, cognitive skills, methodologies and processes for knowledge creation, and discourse for communication with other members of the subject field. In the same vein, Engle and Conant's (2002) research demonstrates that students need to be involved in practicing disciplinary norms (e.g., adopting a skeptical scientific attitude to existing knowledge, and using evidence to develop critical arguments) with their peers and teachers in order to develop an identity as new participants of their discipline.

In professional fields that require students' development of skills for collaborating with co-workers—which is commonplace in most workplaces, teachers may employ group tasks to support students' application of disciplinary norms and communication with fellow students. For teacher educators, it is necessary to facilitate students' professional learning by involving them to perform professional roles along with peers as future school teachers (Anderson & Radencich, 2001; White, 2007). Exploring how students can be facilitated in such professional learning situations through active learning pedagogies is one of the purposes of the current chapter.

20.3 Assessment Tasks Supporting Complex Professional Learning Outcomes

One of the criticisms of traditional education is the over-reliance on summative assessment, which usually takes the form of examinations, tests, and quizzes (Yorke, 2003). Apart from the limited capacity of such standardized assessments in evaluating complex learning outcomes (e.g., creativity, critical thinking, and problem solving), another major concern is students' concentration of study time at

the end of the semester (McNeill, Gosper, & Jing, 2012). As a result of the predominance of the summative assessment regime, many students come to adopt inflexible learning strategies characterized with rote learning by memorizing fragmented pieces of information to be reproduced in examinations, which prevent them from deep engagement with learning problems and developing skills and dispositions for lifelong learning (Clark, 2012; Crossouard, 2010). Proponents of formative assessment argue for the need to promote assessment tasks that:

- (a) are oriented to complex learning outcomes at appropriate levels of cognitive demand (Ecclestone, 2007);
- (b) help students to spread study time across the semester, such as using multiple tasks that are divided into stages, or tasks that are interrelated to help student integrate learning (Carless, Salter, Yang, & Lam, 2011);
- (c) involve students in the assessment process by encouraging self-evaluation and peer feedback (Sadler, 2010); and
- (d) allow students multiple opportunities for obtaining feedback and acting on feedback to improve performance in current or future tasks (i.e., feedback as feeding-forward) (Boud & Molloy, 2012).

A growing body of research literature provides evidence on the role of the above-mentioned features of assessment tasks in helping students improve learning (Evans, 2013). Findings from some studies, however, alert teachers that well-intended assessment and feedback may not always engage students in productive ways of learning, which may occur when assessment tasks are not constructively aligned with intended learning outcomes and supported by teaching and learning processes (Biggs & Tang, 2011), when students are not facilitated with sufficient guidance and feedback (Yang, Tai, & Lim, 2015), and when feedback is offered too late to be acted upon by students (Bailey & Garner, 2010).

Assessment design in professional education fields should, therefore, be oriented to students' professional learning goals and provide opportunities for students' collaboration as co-learners (Zhang et al., 2010). How integrated assessment tasks can be implemented in a coherent and constructive fashion will be discussed further in relation to the case study being reported in the current chapter.

20.4 Methods

Using a qualitative approach, the case study explored the course teacher's and students' feedback experiences in the preschool management course being researched, which was taught by the first author. In-depth data were collected by the second author using two classroom observations ($n = 45$) in a regular lecture session and a student group presentation session, a focus group with six students, and an interview with the teacher. By conducting the study in the naturalistic classroom setting, the researchers were able to capture how the classroom interactions and

social dynamics that gave rise to the rich opportunities of giving and receiving feedback as students were engaged in classroom tasks (Merriam, 1998). The triangulation of data derived from multiple sources (the teacher, students, and the researcher via direct observations of classroom events) ensured the validity of the findings (Holloway & Wheeler, 2009).

20.4.1 Data Collection

Data collection took place in the last two weeks of the teaching period of the course with the focus group and teacher interview following the classroom observations, which allowed the participants to draw on their experiences in the observed sessions when answering interview questions. The observations were recorded using a digital video camera, and the interview and focus group were audio recorded with digital recorders. Informed consent was obtained from the participants prior to data collection. Raw data were stored on desktop computers and CD-ROMs.

Participants of the classroom observations included the teacher and all the students taking the course. The observations focused on the teacher and students' interactions in classroom activities, such as the contents of the teacher's instruction, students' oral report on small group tasks and their group presentations, the teacher's oral feedback comments on students' responses, as well as the overall learning atmosphere. Episodes of classroom events related to the research question were selected and transcribed verbatim by a research assistant, who also took detailed observation notes on the classroom activities by watching the video recordings of the observed sessions. Focusing on classroom episodes helped the researchers to closely examine participants' classroom experiences within bounded time and space, which helped to increase the validity and reliability of findings (Annabi, Crowston, & Heckman, 2008).

In the teacher interview and student focus group, the participants were asked about the purposes, modes, and contents of the learning and assessment tasks, their feedback experiences in association with these tasks, how the teacher and students interacted with one another, and how such experiences were related to students' professional learning goals in the course. The interview and focus group transcripts were written verbatim and sent to participants for member checks to improve the authenticity of the data (Miles & Huberman, 1994).

20.4.2 Data Analysis

Analysis of qualitative data was conducted in an inductive approach (Merriam, 1998; Miles & Huberman, 1994) to derive themes for addressing the research question (*How can pre-service students' professional learning be supported*

through feedback embedded in learning and assessment tasks?). The iterative process of data analysis involved:

- i. reading the transcripts/classroom observation notes repeatedly,
- ii. deriving categories of the participants' experiences related to the research question and select participant quotes/observation notes to illustrate the categories,
- iii. reducing the categories by removing less important categories and constructing subcategories that help describe or explain main categories, and
- iv. drawing major themes by synthesizing the main categories.

The major themes, which represent the participants' experiences of engaging with feedback as embedded in the learning, teaching, and assessment processes in the course, are presented as findings from the case study.

20.5 The Course Under Study

The course on preschool management was offered as a core course to pre-service student teachers in the second semester of their final-year studies. The students possessed prior knowledge and skills in early childhood curriculum and pedagogy. In the course, students were expected to gain basic knowledge and skills related to preschool leadership roles, responsibilities, and associated management issues.

As Fig. 20.1 illustrates, three interrelated strategies were employed to support the students' professional learning goals. The first strategy was familiarization of

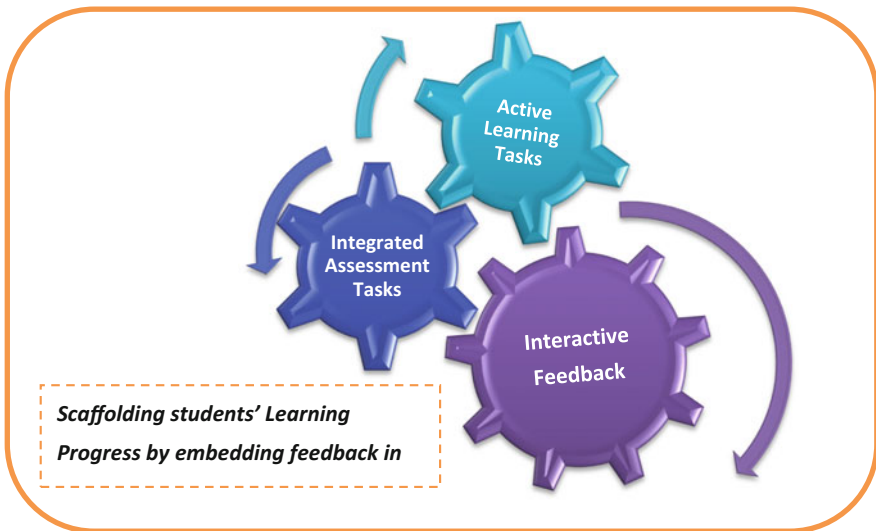


Fig. 20.1 An interactive learning, assessment, and feedback cycle

students with preschool management theories using practical examples, which were incorporated into *active learning tasks*. The second strategy involved the use of *integrated assessment tasks* to help students consolidate and demonstrate the expected learning outcomes. Furthermore, the third strategy was the incorporation of *interactive feedback* into learning and assessment tasks to scaffold students' learning progress to attain professional learning goals (Hounsell, McCune, Hounsell, & Litjens, 2008). The remainder of this section discusses the specifics of each strategy.

20.5.1 Active Learning Tasks

The course teacher used a variety of learning tasks informed by active learning pedagogies (Gholami et al., 2014) to scaffold students' learning in achieving expected learning outcomes, which they should demonstrate in their assessment tasks. The following features characterized the design of classroom learning tasks in the course:

- creating rich opportunities for student participation in classroom learning,
- making learning tasks playful to motivate collaborative learning,
- orienting the learning tasks to the practices of knowledge and skills in simulated preschool management situations, and
- providing guidelines and feedback on task strategies and skills, which could be applied in subsequent learning/assessment tasks.

An example of learning tasks, *the mirror game*, suffices to illustrate the above-mentioned features. The game was intended to increase students' awareness of the importance of quality assurance and self-evaluation in preschool improvement, which was, in turn, necessary for their completion of two final assignments on planning a whole-school activity. In small groups of five to six members, students were given different types of mirrors, including as large mirrors, small mirrors for makeup, zoom-in mirror, and smartphone used as mirrors. The mirrors were used as a metaphor to illustrate the role of quality insurance and self-evaluation. They were asked to view their images in the mirrors and discuss the following guiding questions:

- What do you see from different mirrors?
- What are the functions of different types of mirrors?
- If you see your eye lines are messy from the mirror, what would you do?
- What if you put on your lip stick without using mirror?
- What should you do after we finish the planning of the school activities?
- What is the importance of quality assurance?

In the playful game, students actively took part in the viewing, reviewing, and discussion. A few groups were selected to report their responses to the questions, and the teacher provided overall comments to help students consolidate the shared

learning. While helping students to fulfill the task learning outcome, the task also incorporated the design features mentioned in the preceding discussion, namely: (a) active participation; (b) motivation for collaboration; (c) hands-on application of knowledge and skills; and (d) task-related guidelines and feedback.

20.5.2 Integrated Assessment Tasks

The design of appropriate assessment tasks is vital in fostering students' understanding of preschool management issues. In the course, a group and an individual assignment were integrated to help students develop preschool management knowledge and managerial planning skills. The group assignment involved small groups (6–8 students in each group) in planning a whole-school activity, which they demonstrated in a 20-min presentation and a final report. The assignment required students to demonstrate different management skills, such as setting activity objectives, designing activity plans, and considering issues related to human and financial resource management and risk prevention. The individual assignment was an essay on students' understanding of leadership roles and tasks involved in the organization of whole-school activities, which should be supported by organizational leadership theories (see Fig. 20.2).

By demanding students to display preschool leadership knowledge and management skills in the two assignments and showing them the interconnection between the assignments, students were guided to allocate study time during the semester and obtain teacher guidance and feedback to improve performance (Boud & Molloy, 2012). The integrated assignments were also intended to help students extend the peer support established in completing the group assignment to the stage

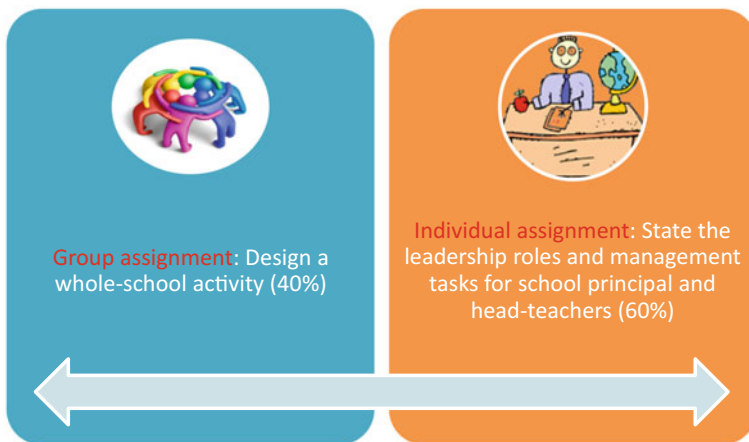


Fig. 20.2 Design of the assessment tasks

of individual essay writing. This is supported by as previous research evidence on the role of peer support in enhancing students' motivation and ability to engage in peer collaboration as future professionals (Barbera, 2009).

20.5.3 Arrangements for Interactive Feedback Supporting Assessment Task Preparation

As Table 20.1 shows, course arrangements were made to provide students with teacher guidance and feedback on assignment preparation. In Week 3 tutorial, the students were provided with guidelines on designing whole-school activities, including related principles, procedures, and management issues. Three self-learning sessions in Weeks 4, 8, and 12 were dedicated for students' group assignment preparation, which was assisted by online materials provided on Moodle (an online Learning Management System). In Weeks 7 and 11, tutorial lessons were arranged for group discussions and consultations, during which each group submitted their preliminary activity plans and explained ideas for the plans. In this way, each group obtained specific feedback from the teacher and benefited from listening to the teacher's feedback on other groups' plans (Nicol & Boyle, 2003). In the tutorial session of Week 13, the groups conducted their presentations and obtained peer feedback and teacher feedback, which were used by students in writing their group report. After the 13-week teaching period, students were invited

Table 20.1 Course arrangement and related feedback on assessment tasks during the semester

Week 1	Lecture/activities	Introduction: course and assessment
Week 2	Lecture/activities	
Week 3	Tutorial/group	Detailed guidelines on the group assignments
Week 4	Self/online learning	
Week 5	Lecture/activities	
Week 6	Lecture/activities	
Week 7	Tutorial/group	Draft submission/specific feedback
Week 8	Self/online learning	
Week 9	Lecture/activities	
Week 10	Lecture/activities	
Week 11	Tutorial/group	In-depth feedback for presentation groups
Week 12	Online learning	
Week 13	Tutorial/group	Group presentations with question-and-answer and teacher feedback

to make appointments for teacher consultations on the individual essay. Throughout the semester, students were encouraged to use the discussion forum on Moodle, emails, or even WhatsApp messages to seek the teacher's and peers' help and feedback.

The above-mentioned arrangements indicate that feedback was incorporated into students' learning and assessment processes in this course, which ensured that students spent sufficient time on the two major assessment tasks and obtained teacher and peer feedback in different learning phases during task preparation. The learning phases included the following: (1) brainstorming, (2) drafting, (3) presentation, and (4) writing-up phases. The writing of the individual essay represented a fifth phase of the students' learning, which helped students to relate the practices to relevant preschool leadership and management theories. By arranging these inter-related phases of assessment tasks preparation supported by frequent teacher-student and peer interactions and feedback, the teacher's feedback practices enabled and sustained students' constant progress in professional learning (Carless et al., 2011).

20.6 Findings

It was challenging for the course teacher to arouse learning interest among the students who did not possess previous experience of teaching in preschools. Hence, feedback was implemented as an integral part of the learning, teaching, and assessment processes (Boud & Associates, 2010). Five main themes emerged from the findings, which address the research question of how feedback strategies were embedded in students' learning and assessment tasks to support their professional learning.

20.6.1 *Feedback Through Teacher Questioning and Student Responses*

Classroom feedback contains informative cues that may be integrated into teacher instruction. The following conversations extracted from the observed lessons may serve as examples. After explaining the principles of job allocation and human resource arrangement, the teacher raised a question, which was responded by two students. Following the students' responses, the teacher elaborated on practical issues that should be considered in relation to staffing arrangements in whole-school activities.

Teacher If you plan to bring your K2 class of 30 kids to visit a supermarket nearby your school, how many teachers and assistants will you arrange, and why?

Student A	Two class teachers and two nannies.
Student B	Two class teachers and one head teacher, because the head teacher normally does not need to teach in any class; plus two nannies.
Teacher	It depends on the staffing situation in the school and the type of activities you plan to carry out in the supermarket. If you have sufficient staff members, it may be easier for you to arrange your staff for visits. Many schools do not have extra staff. Therefore, when you need extra supporting staff, you may consider seeking for help from volunteer groups, such as parents' associations or early childhood student teachers. Actually, for activities such as outing, it would be better to have at least two adults every 8–10 kids.

In the above conversation, the students showed incomplete understanding about the discussion issue, since they had limited prior knowledge about the real pre-school situation. By eliciting their understanding, the teacher was able to give them detailed feedback about the issue. The teacher–student interaction presented above created a teacher instruction—teacher question—student responses—teacher feedback cycle, which stimulated students' thinking in the way described by Chin (2006) about teacher questioning—student response cycles enacted in science classrooms.

Another strategy employed by the teacher was asking students to review what they have learned at the beginning and end of class. Based on the students' answers or their questions, the teacher was able to evaluate the effect of the lessons and provide further elaboration on students' unclear areas of understanding. The following are the examples of such review questions:

- What have you learned from the last lesson?
- What are the key points that you can remember from our last lesson?
- Do you have any questions or comments to share with others?
- Do you understand the new educational policy from today's lecture?
- Please ask the student next to you a question about today's lesson.

From the above examples, it can be inferred that for feedback to be responsive to students' learning needs, teachers may develop an awareness of students' uncertainties and misconceptions and a critical understanding of students' difficulties in learning (Brookfield, 1995; Nuthall, 2005). In the course under study, feedback was offered upon asking questions and observing students' reactions, so that students' difficulties were addressed when students were engaged in classroom learning (Hattie, 2012).

20.6.2 Feedback Incorporated into Learning Tasks

Related to the first strategy is teacher feedback offered when students were involved in active learning tasks that required students practicing professional roles in the

preschool setting (Coffey et al., 2011). In one of the observed lessons, a role play game was arranged in the first half of the lesson, in which five students were assigned to act as candidates and interview panel members in job interviews, with the teacher acting as a clerk. After each interview in the role play, the teacher asked the rest of the class to choose and justify their preferred candidates, and offered comments on their responses.

- Teacher Hello, I am the clerk of this school. Have you taken your supporting documents with you? Okay, I will take you to third floor. Ms. Chen, please meet the school manager, head master, and curriculum officer.
- Student C Welcome to the interview. Here are a few questions for you. Why did you apply for this school?
- Student D I like to play with children. I like to see them grow up happily.
- Student C What is your advantage? Please introduce it simply.
- Student E I have close relationships with children...(laughing), so I think I will be a very good teacher...Moreover, I am good at physical exercises.
- Student F Do you have any questions to ask?
- Student D No.
- Teacher Thank you very much. Let's applaud for the 5 students. Now, let me ask you. If you only have 2 candidates, one is Ms. Wong, another is Ms. Chen, which one would you choose as your staff?
- Student G The first one, because she has a clear voice.
- Teacher Clear voice. Okay, any other opinion? What about you?
- Student H The second one, because she showed her advantages when there was almost no any advantage.
- Teacher I think the 5 students all performed very well. There will be more questions in a real interview. I always suggest school master uses the interview carefully in getting to know about candidates. You have to fire someone if you don't test him his abilities appropriately in the interview.

In reflecting on the reasons for setting active learning tasks, the teacher emphasized the importance of classroom participation in helping students apply professional knowledge and skills and informing the teacher on students' progress as well.

I would emphasize the students' involvement and interactive chances. They have to participate in the class by sharing their ideas, responding to me, or discussion with peers after my introduction. If I do not give them a chance to express their opinions, it will be hard for me to judge whether they have learned. I can evaluate whether students could achieve my teaching objectives.

Similar to the strategy of using questioning to elicit students' responses discussed earlier, when implementing active learning tasks students were able to demonstrate their knowledge and skills, while the teacher feedback helped them to extend and clarify understanding (Hattie, 2012). Thus, the active learning tasks served to make the classroom atmosphere lively for students to exercise

professional roles in preschool management, as well as critically reflect on their understanding facilitated by teacher feedback.

20.6.3 Feedback Integrated into Students' Assessment Task Preparation

In line with the interactive feedback provided on students' learning tasks, teacher guidance and feedback were also made available throughout students' assessment task preparation, which is a strategy recommended by feedback researchers (Boud & Molloy, 2012).

Echoing Carless, Salter, Yang, and Lam (2011) findings, the teacher in the case study adopted a strategy of offering collective feedback on students' queries on their common learning difficulties. For example, in preparing for the group assignment several groups asked questions about managing insurance coverage in whole-school activities, such as, 'Our activity is to go to an outdoor park in Tuen Mun and we plan to hire tourist coach for parents and students. Do we need to budget for travel insurance?' The teacher then provided all students with suggestions related to these questions.

In their focus group, students shared that they were supported to start preparing for assessment tasks early and benefited from sufficient teacher guidance and feedback.

Student G There was a tutorial for setting up groups. The teacher was there to answer questions and comment on the feasibility of our project topics.

Student H In the second lecture, the teacher helped us to organize our ideas and to analyze its feasibility. If we had any questions, we could ask for her help during tutorial. That's why the earlier we started doing our assignments, the more we will benefit in our learning. What teachers taught in the subsequent sessions could also be integrated into our assignments.

Student I Furthermore, the earlier she pushes us to start preparation, the more she could help us evaluate the feasibility of our ideas. If we chose a wrong plan from the very beginning, she could correct our direction early on.

The above examples indicate that giving students sufficient time to develop ideas and ask questions in preparing for assignments is a useful strategy for generating responsive feedback for students' continuous improvement (Hattie & Timperley, 2007). Moreover, the peer discussions and teacher feedback occurring in different phases of undertaking assessment tasks not only helped students to gain a sense of progress but also increased their self-confidence in attaining their learning goals. The integration of feedback into assessment task preparation thus represents a sustainable strategy of implementing interactive feedback in everyday classroom learning, teaching, and assessment processes (Yang & Carless, 2013).

20.6.4 Immediate Feedback on Group Presentations

Verbal feedback provided as soon as students have undertaken an assessment task draws students' attention, since students have fresh memories of difficulties and accomplishments experienced in the task process (White, 2007). In the observed session of students' group presentations, the teacher offered each group succinct comments and invited other groups to raise questions and give suggestions after their presentation. For example, one of the groups explained their proposed whole-school activity plan:

Our group plan to organize a family outing for K1, K2 and K3 students and their families in the beach area nearby Repulse Bay. Our theme is promoting environmental protection and parent-child cooperation. Therefore we will arrange an activity for parents and children to collect as many garbage as possible on beach area.

The teacher then used questions to help the group reflect critically on important issues to improve their plan for the activity.

If that is the activity for the whole-school, what is the approximate number of participants including parents?

Can you suggest any safety and risk assessment and planning issues?

Will you set boundaries for the activity in the beach?

Is going to the beach a common family activity for young children?

What are the major goals of this activity?

What types of tools will you provide to the children to pick up the garbage?

If a kid is missing in the beach, what would you do?

How will you allocate staff members' duties?

For the teacher, the observation and evaluation of the groups' performance in the presentations also provide the teacher invaluable information about the group members' knowledge and skills, which assisted the teacher in giving feedback to support students' group report and essay writing. In this way, feedback was enacted as an iterative cycle focusing on students' ongoing improvements in achieving professional learning goals (Hounsell et al., 2008).

20.6.5 Feedback Facilitating Students' Online Peer Learning and Peer Feedback

Using the online learning management system to enhance communication between teachers and students and among students has become commonplace in higher education. In the case study, the teacher regularly used questions and cues in the discussion forum on Moodle to encourage students to exchange their views on learning issues, for example,

What have you learned today?

Any further sharing on human resource management?

Such simple prompting questions also provided a space for some students to express their views, who would otherwise remain quiet in front of others in the classroom. By reading students' responses and their own questions on learning difficulties, the teacher was able to offer individualized feedback. Echoing the third theme presented earlier, the experiences of engaging in online peer learning and peer feedback also helped students develop the communicative capability of expressing views and giving peer feedback comments in a constructive fashion, which is highly valuable in the workplace where co-workers routinely engage in collaborative knowledge building to accomplish shared goals (Sluijsmans, Brand-Gruwel, & Van Merriënboer, 2002). Moreover, the interactive online feedback encouraged students' critical reflection on their peers' diverse perspectives, which when compared with their own understanding could stimulate their self-reflection and self-assessment (Sadler, 2010).

20.7 Conclusion and Recommendations

The findings show that to help students engage fully with professional theories and issues, it was important to align feedback, teaching, and assessment design to students' levels of understanding (Hattie & Timperley, 2007). Furthermore, the findings demonstrate that teachers can support students' professional learning goals by giving feedback through carefully arranged course schedule and in response to students' needs as they engage with learning and assessment tasks (Hounsell et al., 2008). By using various feedback strategies during the learning and assessment processes, collaboration and communication among the teacher and students can be facilitated, which in turn provide students with regular teacher and peer support to assist in their learning.

Derived from the findings are the following recommendations for optimal feedback practices to support students' professional learning:

1. Setting integrated assessment tasks to scaffold students' learning progress (Boud & Molloy, 2012);
2. Orienting assessment tasks to students' future professional roles and practices (White, 2007);
3. Making learning tasks interesting and challenging to encourage students' motivation to learn (Ecclestone, 2007);
4. Using teacher questioning and student group tasks to promote teacher feedback (Ruiz-Primo, 2011) and peer feedback (Nicol, Thomson, & Breslin, 2014); and
5. Employing online discussions to support peer interaction and peer learning (Gikandi et al., 2011).

Teachers in professional education serve as role models for their students. How teachers model the ways of practicing disciplinary norms and communicating with others affect how their students will engage in future professional practices (Engle & Conant, 2002). In teacher education programs, particularly, witnessing teachers' employment of different pedagogic strategies can help students to begin to construct their pedagogical repertoire. An integral and critical part of such pedagogical strategies is the provision of timely and meaningful feedback through learning and assessment tasks, which can render classroom learning experiences interactive and engaging. To equip the students for future teaching practices, it is vital for teacher educators to integrate these pedagogies in their learning and assessment tasks in order to strengthen students' professional learning. Specific to the field of early childhood education management—the context in which the current study is situated, the collaborative and participative leadership approach can be integrated into students' learning and assessment tasks in order to prepare them for future professional practices and challenges (Ho, 2010).

Although the present study involved a small number of participants, the findings and associated recommendations may offer interesting insights for other professional educators. Future research may explore how student teachers' professional learning can be facilitated by observing teacher educators' pedagogical and feedback practices and evaluating the evidence of how such practices impact on students' learning outcomes.

In conclusion, this study represents the authors' active response to the SoLT initiative being promoted in the institution (see the Introductory chapter). By publicizing the findings in this chapter and sharing the feedback and assessment practices through open-class attended by other teachers, the good practices identified in this study can be shared at the institution and in the wider higher education community for students' learning improvement.

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Chapter 21

Implementing the Assessment of the Generic Attributes of Students Through Self-assessment Survey and ePortfolios at a Higher Education Institution

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Abstract Generic attributes have become important learning outcomes in higher education. This chapter presents the implementation of an initiative which aims to assess students' generic attributes through self-assessment survey and ePortfolios at a higher education institution. Seven generic attributes are identified in the initiative based on the review of literature. They are problem solving, critical thinking, creative thinking, oral and written communication, social interaction, ethical decision making, and global perspectives, which are regarded as the Generic Intended Learning Outcomes (GILOs) of the institution. A survey has been developed to assess students' achievement of these seven GILOs at their entry and final year of study. In supplement of the survey, evidence is collected to demonstrate students' achievement of the GILOs through the use of ePortfolios. A framework illustrating the operational characteristics of GILOs and the corresponding assessment rubrics

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are developed. The rubrics can be used both formatively and summatively to assess students' GILOs achievement. On the one hand, students are informed with the rubrics for selecting evidence to illustrate their GILOs achievement in their ePortfolios. On the other hand, instructors and researchers could use the rubrics to assess students' generic attributes. This study aims to investigate how evidence from ePortfolios and the survey could be integrated to provide a more thorough understanding on students' development and achievement of generic attributes during their study in higher education. The GILOs framework and rubrics, and evidence collected in the initiative, could provide guidance and exemplars to enhance students' achievement in GILOs.

Keywords Generic attributes · GILO · Self-assessment · ePortfolios

21.1 Introduction

Students' generic attributes are seen as important learning outcomes for graduates in higher education (Barrie, 2006). Graduates are required to have not only knowledge but also generic attributes to face the challenges of this fast-changing world. Continuous changes require continuous learning, and thus, higher education institutions have a role to prepare students as lifelong learners. This chapter reports the implementation of an initiative in a higher education institution to assess the generic attributes of students and explore how the assessment might help to contribute to students' further development in these attributes. In the literature on Scholarship of Learning and Teaching (SoLT), it has been articulated that there should be a closer connection between large-scale institutional assessment studies and SoLT research (Hutchings, Huber, & Ciccone, 2011; Shreeve, 2011). In the initiative reported, a large-scale survey on students' generic attributes is conducted. To facilitate the development of student's generic attributes, ePortfolios are used for students to reflect on their learning experiences and their possession of generic attributes. An operational framework and rubrics for supporting and guiding the demonstration of students' generic attributes in ePortfolios have also been developed. This chapter begins with the literature review on generic attributes.

21.1.1 *Generic Attributes*

In higher education institutions around the world, there is an increasing emphasis on graduate attributes (Barrie, 2007; Spronken-Smith et al., 2015). Generic attributes refer to:

the qualities, skills and understandings a university community agrees its students should develop during their time with the institution. These attributes include but go beyond the disciplinary expertise or technical knowledge that has traditionally formed the core of most university courses (Bowden, Hart, King, Trigwell, & Watts, 2000).

As these attributes are more generic, which are not bounded by disciplinary knowledge, they can be transferred to a variety of contexts (Barrie, 2007). There are several reasons for generic attributes to be increasingly valued in higher education: (1) to meet the demand of this ever-changing world (e.g., solving novel problems), (2) to prepare graduates for the world of work and as members of society, and (3) to meet the expectation of employers (who value generic attributes) (Barrie, 2006). A number of institutions have formulated their statements about their graduates' generic attributes (Bowden et al., 2000). Different institutions and researchers focus on or investigate different kinds of attributes. For example, Graduate Skills Assessment, which is recently developed in Australia, focuses on measuring four generic attributes, including critical thinking, problem solving, interpersonal understandings, and written communication (Hambur, Rowe, & Luc, 2002). Collegiate Learning Assessment, which is recommended by the US Department of Education and various universities in the USA, focuses on four generic attributes, including critical thinking, analytic reasoning, problem solving, and written communication skills (Klein, Benjamin, Shavelson, & Bolus, 2007). By illustrating students' achievement of these generic attributes, institutions can provide useful evidence for demonstrating their effectiveness in response to the concern about higher education quality (Spronken-Smith et al., 2015).

21.1.2 Self-assessment of Generic Attributes

Self-assessment instruments are popularly used by higher education institutions for assessing students' generic attributes (Murphy, 2001). Based on the approach of Rasch modeling (Rasch, 1960), Xie, Zhong, Wang, and Lim (2014) developed an item bank for the self-assessment of students on their generic attributes on several dimensions. A Rasch modeling approach has the advantage that the instrument can be used repeatedly without worrying that participants may remember some of the answers they have chosen previously, which is a well-known problem in quantitative instrumentation for an instrument to be administered at multiple times (Creswell, 2015). With an item bank validated by Rasch modeling, the instrument developed by Xie et al. (2014) can be administered several times, and a different set of items will be selected to assess the same dimension validly and reliably. Hence, the use of an item bank based on the Rasch modeling is especially suitable for assessing attributes several times.

21.1.3 Generic Attributes and ePortfolios

In promoting students' development of generic attributes, Matas and Allan (2004) suggested that portfolios can play a facilitating role. Their study showed that the use of portfolios can facilitate the development of various generic attributes such as

analysis and critical evaluation, written communication, group work skills, leadership, and independent lifelong learning. Portfolios in the educational context can be referred to as a meaningful collection of student work that demonstrates progress, with the inclusion of students' self-reflection (Paulson, Paulson, & Meyer, 1991). ePortfolios are electronic version of portfolios which can support the use of various digital artifacts such as videos and allow more flexibility in managing the portfolios (Balaban, Mu, & Divjak, 2013); they can be used for learning (reflection and deep learning) and assessment (summative and formative) (Barrett, 2007). Research has shown that the use of ePortfolios is beneficial to students in promoting reflection, independent learning, deep learning, communication skills, and IT skills. ePortfolio is also a comprehensive, transparent, and continuous form of assessment (Kabilan & Khan, 2012; Lin, 2008). In the previous years, different sets of rubrics have been developed to assess different aspects of learning through the use of ePortfolios (e.g., Dymont & O'Connell, 2011; Fu, Huang, Yang, & Huang, 2012). Research has shown that ePortfolios could facilitate the students' understanding of assessment criteria, self-management of learning, and development of learning products (Lopez-Fernandez & Rodriguez-Illera, 2009). The findings suggest ePortfolios can be a good learning tool for students to record and reflect on their development and achievement in generic attributes.

21.1.4 SoLT and Assessment at the Institutional Level

As reviewed in "Introductory Chapter" of this book, there should be a closer connection between Scholarship of Learning and Teaching (SoLT) research and assessment at the institutional level (see also Shreeve, 2011), as both emphasize student learning, an evidence-based approach, and making student learning outcomes public (Dickson & Treml, 2013; Hutchings et al., 2011). Their difference lies in that SoLT research usually begins with the concern of individual staff members about learning matters in their classrooms, while assessment at the institutional level is usually related to the concern about the quality of the institution (Hutchings et al., 2011). Besides, SoLT research tends to focus more on the improvement of student learning, while assessment at the institutional level more on public accountability (Hutchings et al., 2011). However, as suggested in the latest literature on formative assessment (see Chap. 16), in addition to the summative function of illustrating the effectiveness of student learning, assessment can play a formative role for improving student learning. Student ePortfolios, as reviewed earlier, can play a facilitating role in the development of students' generic attributes. Therefore, there can be a closer connection among SoLT research, institutional assessment of students' generic attributes, and the facilitation of generic attributes' development through the use of ePortfolios. This chapter aims to report the initial findings of an initiative that combines institutional assessment of students' generic attributes and the use of ePortfolios to capture evidence to illustrate and facilitate the development of these generic attributes.

21.2 Method

21.2.1 *Research Context*

The higher education institution being studied commits to prepare students to become lifelong learners and expects graduates to achieve 4Cs—character and moral responsibility, competence and professional excellence, cultivation of wisdom and intellectual engagement, and civic-mindedness and social responsibility—during their study at the institution. The 4Cs can be demonstrated by the achievement of seven Generic Intended Learning Outcomes (GILOs), which are identified by the institution as the graduate attributes based on the literature review with consideration of the local context. These seven GILOs are as follows: (1) problem solving; (2) critical thinking; (3) creative thinking; (4) oral and written communication; (5) social interaction; (6) ethical decision making; and (7) global perspectives, which are the focus of this study.

21.2.2 *GILOs Survey*

The Centre for Learning, Teaching and Technology (LTTC) and Assessment Research Centre (ARC) of the institution developed a question bank to set up a questionnaire for measuring students' self-perceived achievement in GILOs (see Xie et al., 2014 for detail). With the fourth GILO (oral and written communication) further divided into 4a) oral communication and 4b) written communication, a total of eight subscales are included in the GILOs questionnaire, each with four items, for assessing students' self-perception of their achievement in GILOs. In the development of the question bank, the key component skills of each GILO were identified based on an extensive literature review; attitude statements (items) corresponding to these component skills were then written (see Xie et al., 2014). The instrument of GILOs has been validated in a previous study (Xie et al., 2014). Students are asked to self-assess themselves on these GILOs items on a five-point scale. A short paragraph describing each GILO is also presented right above the corresponding GILOs items in the questionnaire to ensure that students have a good understanding of each GILO assessed. For example, the paragraph describing the GILO of problem solving is as follows:

Problem solving skills refer to the ability to deal with novel problems/tasks/situations, to plan with existing resources, to execute a plan and to monitor the process, and to reflect upon solution attempts. Please reflect on the recent problems you have attempted (e.g., facing a novel academic task, working on a new project) and evaluate your own ability in the following stages of problem solving.

Beginning from the academic year of 2012/13, all full-time undergraduate students are requested to complete a self-assessment survey on GILOs in their first year of study. Then, in their final year of study, they will be requested to complete

Your Self-Perception on Generic Intended Learning Outcomes

GILOs	Your Score	Prog. Mean Score	Instit. Mean Score	Your Percentile Rank (Institutional*)
GILO 1: Problem Solving Skills	2.652	2.844	2.899	33.9%
GILO 2: Critical Thinking Skills	1.853	2.861	2.98	1.9%
GILO 3: Creative Thinking Skills	1.981	2.794	2.863	5.1%
GILO 4(a): Oral Communication Skills	2.976	3.415	3.338	27.1%
GILO 4(b): Written Communication Skills	1.299	2.752	2.905	0.6%
GILO 5: Social Interaction Skills	4.249	3.217	3.056	94.9%
GILO 6: Ethical Decision Making	4.943	4.201	4.139	98.1%
GILO 7: Global Perspectives	4.349	3.691	3.705	92.2%

Note. *The institutional norm is based on 1272 students who took the test in the fall semester, 2012. The five-point scale is '1=Poor; 2=Fair; 3=Good; 4=Very Good; 5=Excellent' for GILO 1 - GILO 5, and '1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree' for GILO 6 - GILO 7.

Overall

Based on your score in your entry year, among the eight GILOs within yourself, your top 3 strengths are Ethical Decision Making, Global Perspective and Social Interaction. Based on your percentile rank within institution, compared to your peers in HKIED, your top 3 strengths are Ethical Decision Making, Social Interaction and Global Perspective.



GILO 1: Problem Solving Skills

Problem solving skills refer to the ability to deal with novel problems/tasks/situations, to plan with existing resources, to execute a plan and to monitor the process, and to reflect upon solution attempts.

Compare within Peers: Your performance is higher than 33.9% of the students in your Institution.

Score Interpretation: Your score is 2.652.

You are able to understand a novel and ill-defined problem, to list multiple approaches with existing resources and select from or integrate them, and to review the process and judge the quality of outcomes against explicitly established criteria.

Fig. 21.1 Part of an individual report a student receives based on the self-assessment of GILOs

the survey again, so that changes in their self-assessment of these generic attributes toward the end of study at the institution can be understood.

The context in which the year-one students complete the GILOs survey is the General Education Foundation Course (GEFC), which is a compulsory course for all year-one undergraduate students, lasting for two semesters. The course requires students to attend weekly lectures and tutorials and to write reflective journals on the platform, Mahara, which is an online platform specially designed for the development of ePortfolios. At the beginning of the first semester, questionnaires for the self-assessment of GILOs are distributed in a mass lecture for students to fill in. Then, at the beginning of the second semester, individual reports, which contain students' self-rated scores and mean scores of the program and the institution, are sent to students, so that they can compare their self-assessed achievement in GILOs with the average self-assessed achievement of students at the program and institutional levels. Figure 21.1 illustrates the part of the individual report that a student receives.

A briefing is also conducted in a mass lecture at the beginning of the second semester to ensure that students understand how these individual reports should be read and to ask them to write a reflection on their GILOs achievement and a learning plan for improving their GILOs during their study at the institution based

on these individual reports. The reflection and learning plan are submitted as one of their reflective journals as a course requirement. In this sense, the self-assessment of GILOs, besides playing a summative role to illustrate students' perceived achievement, can be used formatively for improving student learning outcomes.

21.2.3 Assessment Rubrics and the Analysis of ePortfolios to Illustrate GILOs

In addition to the survey, another major part of this initiative is the facilitation of GILOs development through the use of ePortfolios, for allowing students to reflect on their learning experiences and achievement in GILOs. An operational framework and rubrics of GILOs have been developed for analyzing student ePortfolios from the perspective of GILOs. First of all, a framework has been developed based on the literature review on these generic attributes, resulting in the identification of about three-to-five dimensions for each GILO, as presented in Table 21.1. For example, four dimensions were identified for the GILO of problem solving: (1) understanding the problem; (2) planning a solution using existing resources; (3) executing a plan and monitoring the process; and (4) reflecting on and evaluating the outcomes, based on the literature review on problem solving (Curtis & Denton, 2003). After the identification of these dimensions, different levels of sophistication related to each dimension are formulated, which are in the form of a list of descriptive criteria illustrating different levels of achievement, and are referred to as the assessment rubrics of GILOs. For example, on the dimension of "understanding the problem" of problem solving, students' performance can range from a beginning level of "able to understand a well-defined and structural problem," to an outstanding level of "able to understand a novel, ill-defined and complex problem."

The operational framework and rubrics of GILOs serve for three major purposes in this initiative. Firstly, they are distributed to students so that they can have a better understanding of different levels of achievement in these generic learning outcomes. Secondly, student ePortfolios can be analyzed according to the rubrics, for collecting evidence of students' achievement in GILOs. With the collection of evidence, examples illustrating different levels of achievement in GILOs can be identified and further be used for both students and teachers to have an even more concrete understanding of the development of GILOs as well as their assessment.

Hence, in addition to the survey data, an initial analysis of student ePortfolios based on the rubrics of GILOs is reported in this chapter. The student ePortfolios analyzed were collected from the General Education Consolidation Course (GECC) and students' field experience. As reported earlier, the GE Foundation Course (GEFC) is offered for all year-one undergraduate students, while this GE Consolidation Course (GECC) is offered for students approaching the end of their study. The aim of the course is to allow students to consolidate and synthesize their

Table 21.1 Framework of GILOs with dimensions on each GILO identified

GILOs	Dimensions identified
1. Problem solving	<ul style="list-style-type: none"> • Understand the problems • Plan a solution using existing resources • Execute a plan and monitor the process • Reflect on and evaluate the outcomes
2. Critical thinking	<ul style="list-style-type: none"> • Interpretation: to identify explicit and implicit meaning and assumptions • Analysis and inference: to evaluate opinions and logical strength of reasoning and draw conclusions • Justify and theorize: to develop and defend a position on an issue, justifying procedures and decisions with reason and evidence
3. Creative thinking	<ul style="list-style-type: none"> • Originality: ability to generate new ideas • Fluency: ability to generate many responses or ideas • Flexibility: ability to change the form, modify information, or shift perspectives • Elaboration: ability to develop/expand one's rough ideas by adding details and sophistication
4a. Oral communication	<ul style="list-style-type: none"> • Listening: capturing and understanding verbal and nonverbal messages from others and when appropriate, go beyond those messages to understand others' intentions and motives • Interacting: oriented toward others physically and psychologically, communicating to others to understand what they are saying • Speaking: generating verbal and nonverbal messages to accomplish personal and social goals (organization, delivery, language, and content of the oral product will be examined)
4b. Written communication	<ul style="list-style-type: none"> • Organization/structure: grouping and sequencing of ideas and supporting materials • Language/grammar: vocabulary, terminology, and sentence structure • Supporting material: explanations, examples, illustrations, statistics, analogies, and quotations from relevant authorities and other kinds of information or analysis that supports the principal ideas • Context and purpose/format: choosing appropriate format that is suitable for the context and purpose
5. Social interaction	<ul style="list-style-type: none"> • Relationship initiation: initiation of interactions and relationships • Self-disclosure: self-disclosing of personal information • Negative assertion: assertion of personal rights and displeasure with others • Emotional support: provide emotional support to significant others • Conflict management: management of interpersonal conflicts that arise in close relationship
6. Ethical decision making	<ul style="list-style-type: none"> • Moral awareness: recognizing moral issues, being able to interpret the situation as being moral (or evil) • Making moral judgment: moral reasoning, considering whether the decision would have harmful/beneficial consequences to others when making decisions • Establishing moral intention: prioritizing moral concerns over other values (self-interests) • Engaging in moral behavior: promoting moral integrity to others

(continued)

Table 21.1 (continued)

GILOs	Dimensions identified
7. Global perspectives	<ul style="list-style-type: none"> • Perspective consciousness: aware that one’s own perspective is cultural-bounded • Knowledge of global issues and problems: aware of major issues and emerging problems facing the entire planet • Cross-culture competence: understand how different cultures make people view the world differently • Knowledge of global interconnection: aware that the world functions as an interconnected system • Awareness of human choices: aware that human choices made in the present will impact on future generations

learning experiences at the institution by reflecting on the meaning of what they have learned and connecting these experiences with their lives. The course requires students to submit ePortfolios for compiling their learning experiences and reflections. Before the full implementation of the course in the academic year of 2015/16, a pilot run was conducted in the second semester of the year of 2014/15, with the enrollment of 30 students, from which their ePortfolios were collected and analyzed. The second source of ePortfolios analyzed was students’ field experience, as students at the institution have to engage in the field experience of teaching in primary and secondary schools. A requirement of this field experience is the submission of ePortfolios that compile students’ experiences, reflections, and other materials such as lesson plans. Their ePortfolios were also analyzed based on the rubrics of GILOs.

21.3 Results

This section presents some preliminary findings of the initiative, including students’ self-assessment of their achievement in GILOs, and the analysis of student ePortfolios based on the rubrics of GILOs.

21.3.1 Student GILOs Survey

Beginning from the academic year of 2012/13, a total of three student cohorts have finished the GILOs survey in their first year of study. A total of 1218, 977, and 905 sets of questionnaires were received in 2012, 2013, and 2014, respectively. The participating students will finish the survey again in their final year of study, but as the first cohort (year 2012) has not yet entered the final year of study, no comparison between the first year’s and final year’s self-assessment on GILOs can be conducted at the time being. The results presented in this chapter are average scores

Table 21.2 Institutional mean scores on self-assessment of GILOs of the three year-one student cohorts

GILOs	Year 2012	Year 2013	Year 2014	Average
Problem solving	2.90	3.12	3.09	3.02
Critical thinking	2.99	3.11	3.12	3.07
Creative thinking	2.88	3.15	3.13	3.04
Oral communication	3.32	3.55	3.39	3.41
Written communication	2.91	3.06	3.07	3.00
Social interaction	3.05	3.35	3.47	3.27
Ethical decision making	4.07	3.91	3.69	3.91
Global perspectives	3.69	4.04	3.95	3.88

of the institution of these three student cohorts, who finished the GILOs survey in their first year of study, as shown in Table 21.2.

Figure 21.2 presents the institutional mean scores on students’ self-assessment of GILOs in descending order of the three year-one student cohorts on average. It can be seen that these year-one students tended to assess themselves more positively on ethical decision making and global perspectives. For GILOs of problem solving, critical thinking, creative thinking, and written communication, the self-assessed scores were around three on a five-point scale. In between these two clusters of GILOs were oral communication and social interaction. Such a pattern was consistently observed in all three student cohorts, in which global perspectives and ethical decision making were consistently the two GILOs with the highest self-assessed scores, with scores ranging from about 3.7 to 4.1; oral communication and social interaction were consistently ranked as the third or fourth in terms of students’ self-assessment, with scores ranging from about 3.1 to 3.6, while problem

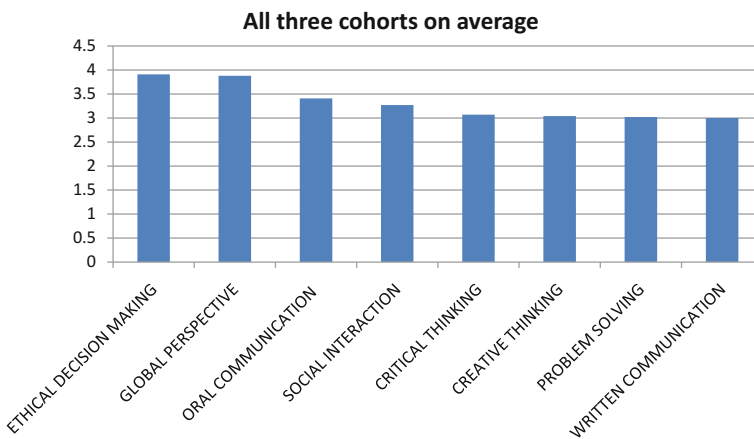


Fig. 21.2 Institutional mean scores on self-assessment of GILOs of the three cohorts of students on average

solving, critical thinking, creative thinking, and written communication were consistently rated as the last four, with scores close to around 3.

21.3.2 *Capturing GILOs Achievement in Student ePortfolios*

The second part of the results is related to the analysis of student ePortfolios based on the rubrics developed for assessing GILOs. The eight domains of GILOs (with the GILO of oral and written communication divided into two domains) have each of them a number of dimensions with different levels of sophistication. A total of seven student ePortfolios received so far have been analyzed to identify the achievement in GILOs as manifested in these ePortfolios. Presented in this section are initial examples we found based on the framework and rubrics that can illustrate students' achievement in GILOs.

21.3.2.1 Problem Solving

The first GILO is problem solving. In one of the ePortfolios, a student reflected on his field experience of teaching Chinese language in a secondary school. He asked the students to have an unseen dictation; most of them performed satisfactorily, but a student with emotional problems received zero mark. Their original Chinese teacher told him that the usual practice was to ask the failed student to take the unseen dictation again. However, after considering that the student's ability was not that good, he and the Chinese teacher decided to design an unseen dictation worksheet for the student to fill in the missing content. With the prompts of the worksheet, the student performed much better in the second dictation and promised that he would strive for progress in the next dictation. This example illustrates that the student of the institution has a good understanding of the problem. Then, he planned the solution, executed it, and evaluated the outcome. All these are essential elements of problem solving.

21.3.2.2 Critical Thinking

An example that can illustrate the achievement in the GILO of critical thinking was from the ePortfolio of a student who reflected on her experience of writing an autobiographical report in a course. She reviewed her past by applying psychological theories and analyzed the meaning of her growing up as a happy baby, always with a smile on her face. She argued that our past experiences make us different from one another and allow us to have distinct ways of thinking and different personalities. She further argued that without these retrospective memories, she would not be complete and might not even know who she is. Then, she came up with the conclusion that our past is what makes us a unique and complete

person. This example illustrates her effort in identifying the implicit meaning of her growing up as a happy baby and how she drew a sound conclusion based on a line of reasoning. These are essential elements of critical thinking as articulated in the framework of GILOs.

21.3.2.3 Creative Thinking

An important dimension of creative thinking is flexibility, which involves the ability to shift perspective, as illustrated in the framework of GILOs. In the example of problem solving presented above, the student tried an innovative approach of designing an unseen dictation worksheet for the student who failed in the dictation, rather than following the original practice to ask him to take the dictation again. It indicates the ability to think flexibly and hence is indicative of the GILO of creative thinking.

21.3.2.4 Oral Communication

The fourth GILO has domains of oral communication and written communication. An example illustrating the achievement in the GILO of oral communication could be found in the ePortfolio of a student reflecting on her research learning experience. She mentioned that her participation in a research team led by professors was a rewarding experience, but there were language barriers between coworkers and her initially, as she had difficulties in listening to the Mandarin spoken by them. However, by actively involving in conversation with them, she could now communicate with them fluently. This example involves the understanding of verbal and nonverbal messages from others and the generation of verbal and nonverbal messages to achieve certain goals, which are essential elements of oral communication.

21.3.2.5 Written Communication

In our analysis, we did not find examples that students had articulated explicitly their achievement in written communication in their reflection. However, their ePortfolios are well organized, with the use of supporting materials such as tables, examples, pictures, and videos, and these are essential elements of effective written communication.

21.3.2.6 Social Interaction

The student who reflected on her research learning experience reported above also articulated an achievement in the GILO of social interaction. She mentioned that

she faced the problem of high workload, but she was afraid of expressing the concern because it might imply that she was not competent. However, after much deliberation, she decided to discuss with her professors about the issue of workload, point out her difficulties in dealing with tasks genuinely, and suggest ways to improve the effectiveness. Her professors accepted her ideas, and finally, they had a wonderful time and could finish the projects on time. It illustrates her willingness to disclose herself even on the negative side, which is an essential element of social interaction.

21.3.2.7 Ethical Decision Making

In the example of ethical decision making, a student reflected on the experience of sharing a video about animal factories and the abuse of human power in a group project. It illustrates the awareness of moral issues, as she identified the issues of animal rights and human responsibility. She argued that although animals are not as clever as human, they still do not want pain and suffering. And although human beings are cleverer than other animals and have the power to “rule” them, it seems that human beings are abusing the power now. Following this line of moral reasoning, she came up with the conclusion that human beings have the responsibility to protect the well-being of factory animals.

21.3.2.8 Global Perspectives

In the example of global perspectives, a student reflected on her experience of an 8-day winter study camp in a university in Beijing, aiming at enriching the knowledge about Chinese traditional culture. Before the trip, she was anxious about interacting with strangers. During the trip, she was excited about meeting new friends and encountering the surrounding environment and new culture. After the trip, she felt satisfied and wish to have more exploration on her own city. This example illustrates the appreciation of the existence of different cultures, which is essential for a person to have global perspectives.

21.4 Discussion

This chapter presents some initial findings of an initiative that implements the assessment of generic attributes at a higher education institution. Rather than focusing on students’ examination results, this study takes into consideration the Generic Intended Learning Outcomes of students, which are valued as important attributes of graduates from the institution. The survey findings of three student cohorts suggest a consistent pattern that overall speaking, the year-one students of the institution tend to self-assess themselves more positively on attributes of global

perspectives and ethical decision making, followed by social interaction and oral communication. The average self-assessed scores of problem solving, critical thinking, creative thinking, and written communication are around three on a five-point scale. It suggests that the institution may need to put more effort to boost student competences on the latter four attributes. On the other hand, further research is needed to understand why students perceive themselves more favorably on ethical decision and global perspectives compared to other generic attributes and whether these self-perceived differences can be substantiated with objective measures. In the coming future, students in their final year of study will complete the survey one more time, so changes in their self-assessed achievement in these generic attributes after the study at the institution can be examined.

In this initiative, one proposed way to facilitate the development of students' generic attributes is the use of ePortfolios, for students to reflect on their achievement in GILOs and plan for improvement. Resources including the operational framework and assessment rubrics of GILOs are provided for students. The initial analysis of student ePortfolios based on these rubrics has identified some good examples of students' achievement in different GILOs. In our analysis, it was also found that some examples might be indicative of more than one GILO. For instance, the example of problem solving reported above was also indicative of creative thinking emphasizing the capability to think flexibly. Similarly, the example of ethical decision making was also indicative of critical thinking emphasizing the competence of reasoning. On the other hand, examples we captured from student ePortfolios might not be able to illustrate all dimensions identified in the framework of GILOs (see Table 21.1). For instance, in the example of global perspectives reported above, the student mainly mentioned about the appreciation of the existence of different cultures, but not the awareness of global problems and that human choices made today will affect future generations. More student ePortfolios will be analyzed in the future, and we will explore whether the framework and rubrics should be modified to cater the needs of the institution. Furthermore, with more student ePortfolios analyzed, we will explore whether students rating themselves highly on a dimension are also likely to illustrate the achievement in this dimension in their ePortfolios.

As an institution-level initiative that employs the use of ePortfolios, the roles of the institution and digital technology have been highlighted in this study. As a pilot study, this chapter has presented a consistent pattern of students' self-assessed achievement in GILOs in their first year of study and illustrated the usefulness of the framework and rubrics in identifying students' achievement in GILOs in their ePortfolios. In the coming future, changes in self-assessed achievement in GILOs after students' study at the institution, and the usefulness of ePortfolios in facilitating students' development in GILOs, will be examined. Besides, with the modification of the framework and rubrics, and more student ePortfolios analyzed, the relationship between self-assessed achievement in GILOs and students' performance on these generic attributes as captured in their ePortfolios will be studied.

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Part IV

Conclusion

Chapter 22

Scholarship of Learning and Teaching in a Digital Era: The Way Forward

Siu Cheung Kong and Ming Lai

Abstract The improvement of student learning is the chief goal of higher education institutions all around the world and is the ultimate purpose of scholarship of learning and teaching (SoLT). The chapters in this book contribute to the four interrelated themes of SoLT, namely staff professional development, enhancement of student learning experience, assessment, and digital technology, as put forward in the framework in Chap. 1. In chapters under the theme of staff professional development (PD), a strong connection between staff PD and student learning is articulated, and digital technology is employed as a means for effective PD as well as the objective of PD. With the coverage of a wide range of disciplines, chapters under the theme of enhancement of student learning experience indicate that in addition to the knowledge aspect, student learning involves other aspects such as attitudes, behaviours, self-awareness, self-regulated learning, suggesting that SoLT research is better not to focus too narrowly on formal classroom teaching and learning. Chapters under the theme of assessment show that with an appropriate design, assessment, no matter at the classroom level or institutional level, can play a facilitative role in student learning. Moreover, digital technologies, such as ePortfolios and instant feedback systems, can be employed as assessment tools for facilitating student learning. Overall speaking, these chapters signify a shift of focus from teachers' teaching towards students' learning, which is the ultimate goal of SoLT.

Keywords Scholarship of learning and teaching · Higher education · Professional development · Enhanced student learning experience · Assessment · Digital technology

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22.1 Introduction

The chapters in this book are organized around the themes identified in the framework of Scholarship of Learning and Teaching (SoLT) put forward in Chap. 1. In this concluding chapter, we will summarize the findings in previous chapters and propose the way forward for SoLT.

22.2 Staff Professional Development

The chapters in Part I of the book focus on staff professional development. In Chap. 2, Wang and Ma analysed an initiative of building a mobile learning community for promoting mobile learning in a higher education institution. They identified several key factors for a mobile learning community to be successful, namely strategic recruitment of community members, setting up a website with rich information, organizing sharing sessions, having an impact on student learning, and having an impact on staff development. The latter two are particularly important, as student learning is the ultimate goal of SoLT, and there should be a close connection between staff development and student learning, including the building of staff capacity to conduct SoLT work on student learning.

In Chap. 3, Leung studied an initiative of designing and implementing digital lectures (DLs) among a group of teaching staff with not much technology background. It was found that the sharing of practices could enhance teaching staff's confidence in using digital technology. Evidence of professional development could be found in teaching staff's reflections. Leung also collected data from students, with the finding that students in general agreed DLs could enhance their learning. In the next phase, the production and adoption of DLs will be further promoted in the same department and other departments as well.

In Chap. 4, Murthy, Warriem, and Iyer explored the design of a blended (face-to-face blended with online sessions) professional development programme based on an A2I2 (Align-Attain-Integrate-Investigate) model. A total of 4000 teachers attended the programme for building their capacity to integrate technology into student-centred learning. They found that after the programme, the teachers had a higher intention to adopt a student-centred learning approach, improved their perceived competence of integrating technology into their lessons, and observed an increased engagement of students in learning. The study suggests that it is possible to scale up a teacher development programme to cater for a large number of participants towards student-centred learning.

In Chap. 5, Chan and Kong presented a continuous modification of a staff professional development (SPD) programme to cater for needs of teaching staff and to satisfy two key criteria of an effective SPD programme, namely acquisition of

new knowledge/skills and transformation of such knowledge/skills into classroom practice for enhancing student learning. An iterative three-stage model was proposed, with Stage 1 as turning new knowledge/skills into innovative teaching, Stage 2 as trying out and refinement, and Stage 3 as measurement of effectiveness for improvement, with student evaluations and evidence of student learning collected.

In Chap. 6, Cheng presented a case study of leveraging knowledge in a higher education institution through communities of practice (CoP) in Field Experience (FE) Supervision. Based on a Yin-Yang framework, Cheng found that participation and reification (making things real) were both important in cultivating CoP and they were interdependent and intertwined. Cheng reported the use of an online platform, the video-based learning community (VBLC), for FE supervisors to compare assessment records with other assessors, suggesting that CoP could be regarded as a knowledge management tool for an institution to leverage knowledge.

In Chap. 7, Song and Kong reported a Bring Your Own Device (BYOD) initiative, with 17 teaching staff designing their own learning activities in a BYOD-supported learning environment. Based on analyses of class videos, teacher interviews, teaching plans, field notes, and resources on the BYOD website, they identified the affordances and constraints of BYOD in teachers' pedagogical practices. They also found that some teaching staff might adopt a wide range of affordances, while others might adopt one or two of them. On the other hand, some teaching staff might only experience technical constraint, while others might experience personal and social constraints as well.

As reviewed above, several chapters in Part I have related staff professional development to student learning. The impact on student learning was identified as a key factor for building a mobile learning community (Chap. 2). Students' views were collected in addition to teaching staff's in the design and implementation of digital lectures (Chap. 3). The investigation of the effects of practice (Investigate) was embedded in the A2I2 model of professional development (Chap. 4). Similarly, the collection of evidence of student learning is embedded in Stage 3 in the three-stage SPD model in Chap. 5. Such a connection between staff professional development and student learning is especially important for SoLT research, as the goal of capacity building of teaching staff should be for the improvement of student learning (Hutchings & Shulman, 1999; Martensson, Roxa, & Olsson, 2011). Another theme noticeable in these chapters is the use of digital technology. Digital technology can be employed as a means for effective professional development, such as the use of VBLC for comparing assessment records (Chap. 6). It can also be the objective of staff development, such as the design of learning activities in a BYOD-supported environment (Chap. 7). In more of the chapters, technology is employed as a means for effective professional development as well as the objective of staff development, which often involves the integration of technology into teaching and learning activities.

22.3 Enhancement of Student Learning Experience

The chapters in Part II have a focus on the enhancement of student learning experience. In Chap. 8, Chow, So, Cheung, and Yeung compared the effects of three teaching approaches (direct teaching, hands-on teaching, and simulation game-based teaching) on students' changes of knowledge, attitude, and behaviour related to plastic waste management. They found that all approaches were effective to enhance students' knowledge, with simulation game-based having the largest effect size. On the other hand, students' attitude and behaviour were more likely to be facilitated through hands-on and simulation game-based approaches. Their results suggested that by enriching students' learning experience through hands-on and simulation game-based approaches, students' attitude and behaviour related to plastic waste could be enhanced in addition to the acquisition of knowledge.

In Chap. 9, Tsang, Chow, So, Liu, Kwok, and Ho developed a teaching kit, with prototypes on different topics such as green energy, renewable energy, and water treatment, for students to build different green technology systems. The teaching kit allowed learners to connect conceptual ideas to physical systems in a meaningful and more interactive way. The authors found that the teaching kit could help students as well as teachers to enhance their knowledge of green energy.

In Chap. 10, Cheang, Chow, and Fok documented the experience of promoting students' action competence in marine conservation through a field-based and service-based programme, Courier of Marine Stewardship, which involved activities such as scuba diving, delivering talks to local school students, and community service of seabed cleanup. By means of an action competence test and student interviews, the authors found that the programme was effective in enhancing students' knowledge as well as attitudes towards marine conservation. They also raised the challenges they encountered in organizing this unconventional programme, including financial and logistic constraints, risks involved in scuba diving, and students' expectation of leisure, which might hinder their development of knowledge.

While community service was only part of the programme reported in Chap. 10, Chap. 11 had the chief focus on service learning. Xu and Chan investigated the effects of a service learning programme on students' self-management and self-awareness (conscious attention to one's private self, public self, and the surroundings). They found that service learning could contribute to the enhancement of students' self-management competence, but not their self-awareness. However, by breaking down the construct of service learning into elements such as meaningful experience, diversity, reflection, youth voice, and connection to curriculum, they found marginally positive correlations between these elements and students' self-awareness.

In Chap. 12, Tam reflected on his experience of teaching a course on literary creation, arguing that elements of literary criticism should be integrated with literary creation for students to master the skills of creative writing. Interviews with students suggested that students might not realize the close connection between the two, and some of them might have an impression that creative writing did not require basic knowledge. However, there were students mentioning that the

learning of literary criticism and creative writing were mutually facilitative. Tam also noticed that appreciating and criticizing peer's writing was an important way for students to improve their writing skills and aesthetic quality.

In Chap. 13, Wang and Li explored the use of new media (e-books, streaming media, and social media) for a group of Chinese as a Second Language (CSL) learners to learn vocabularies autonomously beyond classrooms. They highlighted the importance of autonomous learning (learners taking charge of their learning), provided guidance and learning plans for using different types of new media, and proposed criteria for choosing learning materials. Evidence of student learning with their proposed approach was also presented in the chapter.

In Chap. 14, Lai expressed the concern that many students had difficulties in learning the use of irony. With a detailed analysis of the use of irony in the novel, "The Stubborn Porridge", and based on theories of literature and the historical background of the novel, Lai argued that by means of extracurricular reading, students could have an in-depth understanding of the use of irony, which could enhance their language learning, especially in terms of their reading ability and appreciation of literature.

In Chap. 15, Cheng and Kong employed computer software to facilitate students' coherent concept image formation by allowing students to play an active role in re-inventing mathematical notions. They illustrated with three examples, the use of GeoGebra Applet for the learning of areas of closed figures, Graphical Partitioning Model for the learning of fraction addition/subtraction, and a GeoGebra-based dynamic Applet for the learning of the limit of a sequence. They identified common pedagogical design patterns behind these three examples, which could be summarized as three general stages of motivating, exploring, and re-inventing.

It can be seen that chapters in Part II cover a wide range of disciplines, from science and mathematics to arts and language learning. Various teaching and learning approaches and initiatives are involved for enhancing student learning experience, such as the approach of simulation game-based teaching (Chap. 8), the use of teaching kit for students to build green technology systems (Chap. 9), programmes of Marine Stewardship (Chap. 10) and service learning (Chap. 11), integration of literacy criticism and literacy creation (Chap. 12), the use of new media for autonomous vocabulary learning (Chap. 13), the use of irony in writing (Chap. 14), and the use of computer software for the learning of mathematical concepts (Chap. 15). They also cover a wide range of student learning outcomes, including knowledge, attitudes, behaviour, a test on action competence in marine protection, self-management competence, self-awareness, and vocabulary learning, suggesting that student learning is better not to be narrowly defined by the knowledge aspect or academic results, but involve other aspects as well. The emerged theme of students' self-regulated learning, as manifested in ideas such as self-management competence and autonomous learning beyond classrooms, is especially important to the literature on scholarship of teaching (and learning), which might focus too narrowly on formal classroom teaching (Boshier & Huang, 2008;

Willox & Lackeyram, 2009). Digital technology, including the new media and educational software, can play a facilitative role in shifting the focus from teachers' teaching to students' learning.

22.4 Assessment

The chapters in Part III focus on assessment. It begins with a chapter by Lam, which provided a detailed review on major theories in formative assessment. In addition to theories, Lam discussed research-based exemplary practices of using formative assessment in classroom settings, and proposed the way forward for formative assessment to be employed as a strategy for reforming education.

While Lam's chapter mainly focused on conceptual matters, the chapters followed were empirical studies exploring the effects of formative assessment on student learning. In Chap. 17, Lam, Cheng, and Yang reported a quasi-experiment to examine the effects of formative feedback on students' motivation and positive emotions. They found that formative feedback had a positive effect on students' intrinsic motivation to learn as well as positive affect.

In Chap. 18, Wong and Yang examined the use of an instant response system for instant feedback and that of a learning management system for asynchronous feedback. They found that through the provision of feedback, these technology-mediated platforms were effective for enhancing students' learning engagement, autonomy, and collaborative knowledge building. They argued further that the use of digital technology encouraged students' sharing of learning with peers and the teacher.

In Chap. 19, Lee and Yang documented a case study of incorporating feedback strategies into the pedagogical design of tutorial sessions of a General Education Foundation Course. In addition to teachers' feedback, peer feedback was included in the pedagogical design as well. The authors found that these feedback strategies were useful in developing students' critical judgement and independent learning.

In Chap. 20, Han and Yang explored how students' professional learning could be enhanced by incorporating feedback in learning and assessment tasks. Through classroom observations, student focus groups, teachers' interview, and reflective notes, the authors identified three interrelated strategies that could facilitate students' professional learning, namely designing active learning tasks, using integrated assessment, and employing interactive feedback.

Chapter 21 had a different focus from chapters above. Rather than studying the effects of formative assessment in a classroom setting, Lai, Tai, Kong, and Wang reported an initiative of an institution-wide assessment of students' generic attributes through self-assessment survey and ePortfolios. A consistent pattern was found across three year-one student cohorts on their self-assessed scores of generic attributes. Assessment rubrics were also applied for collecting evidence of student achievement in different generic attributes in their ePortfolios. The study provided a

further direction to proceed for employing the institution-wide assessment for the enhancement of students' generic attributes through self-reflection in ePortfolios.

The chapters in Part III illustrate that with an appropriate design, assessment can play a key facilitative role in student learning. It can enhance students' intrinsic motivation to learn (Chap. 17), engagement and autonomy to learn and collaborative knowledge building (Chap. 18), critical judgement and independent learning (Chap. 19), and professional learning (Chap. 20). When Boyer (1990) first put forward the idea of scholarship of teaching, he has envisioned that teachers engaging in SoLT should "stimulate active, not passive, learning and encourage students to be critical, creative thinkers, with the capacity to go on learning after their college days are over" (p. 24). The findings in Part III suggest that assessment has a key role to play in contributing to Boyer's (1990) vision. On the other hand, assessment at the institutional level is an area in need of more research in the literature on SoLT (Shreeve, 2011). Chapter 21 illustrates a possible direction of integrating institutional assessment with the improvement of student learning.

22.5 Authors' Responses to Our Major Claims on SoLT

As reported in the Introductory chapter, the authors of each chapter were asked to respond to our major claims related to SoLT. Generally speaking, they mentioned the importance of the institution in providing professional development opportunities for staff members to improve and share teaching practices and to conduct SoLT works, and creating significant learning experiences for students. They mentioned the importance of having opportunities to share their findings and ideas inside and outside the institution. In fact, this book project is an initiative of facilitating this kind of sharing among staff members on SoLT works, and several sharing sessions with authors presenting their findings and ideas have been conducted at the institution. The significance of digital technologies in enhancing student learning was highlighted in several chapters. In chapters with no use of digital technologies, the authors also proposed some possible ways for further improvement of student learning with the use of digital technologies. Several authors mentioned the use of websites for the dissemination of findings, which is in line with Shulman's (2004) idea that digital tools are effective means for sharing SoLT works.

22.6 Conclusion—From Teachers' Teaching Towards Students' Learning

The improvement of student learning is the chief goal of higher education institutions all around the world and is the ultimate purpose of SoLT. The chapters in this book contribute to four interrelated themes of staff professional development,

enhancement of student learning experience, assessment, and digital technology in the literature on SoLT.

Overall speaking, the chapters signify a shift of focus from teachers' teaching towards students' learning (Boshier & Huang, 2008; Huba & Freed, 2000). While staff professional development is traditionally related solely to capacity building of teaching staff, its connection with student learning has been highlighted in several chapters in this book. Moreover, the variety of student learning outcomes studied in this book suggest that student learning is not necessarily defined solely in terms of the knowledge aspect. The study on self-regulated learning, especially, indicates a shift of focus towards students' learning, is hence an area worth more research attention in the field of SoLT.

The chapters on assessment suggest that with an appropriate design, assessment can contribute to the improvement of student learning. Peer assessment, which was mentioned in Chaps. 12 and 19, is a topic worth further exploration, as it signifies a shift of focus from teachers to students in terms of assessment. Institutional-level assessment, especially on how it can contribute to student learning, is another topic worth studying. Chapter 21, with some preliminary data reported on an institutional initiative for assessing and enhancing students' generic attributes with the use of self-assessment survey and ePortfolios, indicates several SoLT studies are ready to be undertaken.

The chapters in this book also indicate that digital technology can contribute significantly to all three important aspects of SoLT, namely staff professional development, enhancement of student learning experience, and assessment. It also facilitates the shift towards students' learning. With the advancement of more technological tools that can be combined with the pedagogical design (Dede & Richards, 2012; Laurillard, 2002; Oliver, 2013; Stodberg, 2012), it is expected that digital technology will play an even more significant role in SoLT research in the coming future (Kreber & Kanuka, 2006).

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Retraction Note to: Affordances and Constraints of BYOD (Bring Your Own Device) for Learning in Higher Education: Teachers' Perspectives

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Retraction Note to:
Chapter 7 in: S.C. Kong et al. (eds.), *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era*, https://doi.org/10.1007/978-981-10-3344-5_7

The authors have retracted this chapter [1] because it has been previously published in Song and Kong (2017) [2]. The contents of this chapter are therefore redundant. All authors agree to this retraction and apologise for any inconvenience caused.

1. Yanjie Song and Siu Cheung Kong, Affordances and Constraints of BYOD (Bring Your Own Device) for Learning in Higher Education: Teachers' Perspectives. In: Siu Cheung Kong, Tak Lam Wong, Min Yang, Cheuk Fai Chow, Ka Ho Tse (eds), *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era*, Springer Singapore, (2017) pp 105–122. ISBN: 978-981-10-3342-1.
2. Yanjie Song and Siu Cheung Kong, Affordances and constraints of BYOD (Bring Your Own Device) for learning and teaching in higher education: Teachers' perspectives, *The Internet and Higher Education* (2017) 32:39–46.

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