Applying "First Principles of Instruction" In a Blended Learning Course

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Abstract. In this paper, we share our experience of using the "First Principles" of instruction [1] to design a blended learning course: (a) Learning is promoted when learner are engaged in solving real-world problems, (b) Learning is promoted when existing knowledge is activated as a foundation for new knowledge, (c) Learning is promoted when new knowledge is demonstrated to the learner, (d) Learning is promoted when new knowledge is applied by learner, and (e) Learning is promoted when new knowledge is integrated into the learner's world. We describe the five "First Principles" of instruction by Merrill and identify the specific instructional activities that support each principle in either the face-to-face mode or e-learning mode. We conducted a survey study to gather students' perspectives of the organization of the blended course as well as the ability of the blended learning course to engage student learning. Eighteen students were involved in the study. The results showed that the blended learning course was well organized to provide meaningful activities, and that the blended course provided a positive engaging learning environment for the students.

Keywords: online learning, quality assurance, student engagement, student satisfaction, first principles of instruction, blended learning.

1 Introduction

In the recent years, more and more universities are using the blended approach to deliver their courses. In the National Institute of Education, Nanyang Technological University, we have been using the blended approach to deliver our graduate courses. One of the courses in the Master of Arts in Instructional Design and Technologies (MAIDT) program has been using the blended approach supported by Merrill's First Principles of instruction for the last decade [1]. In this paper, we describe the five "First Principles" of instruction by Merrill and identify the specific instructional activities that support each principle in either the face-to-face mode or e- learning mode. We also conducted a survey study to gather students' perspectives of the organization of the blended course as well as the ability of the blended learning course to engage student learning.

K.C. Li et al. (Eds.): ICTE 2014, CCIS 494, pp. 127–135, 2015.

1.1 Background

The "Multimedia Design" course is currently offered as an elective course in the Master of Arts in instructional design and technologies (MAIDT) program. It was a 39 hours face-to-face course in 13 sessions (ie 13 weeks). Each session typically includes lectures, discussion, exercises, and feedback of the students' projects by their classmates and instructor. The purpose of using the blended learning approach in this course was to cut down the face-to-face sessions. This was because many students were often late for the face-to-face sessions. As a result, they missed the lectures and other in class activities.

We took seven years to convert the face-to-face "Multimedia Design" course to a blended learning one [2]. In 2007, we decreased the duration of the course from 13 weeks to 4 days. The 4 days included 32 hours of face-to-face sessions and 7 hours of asynchronous online discussion. In 2008, we shortened the face-to-face time from 32 hours to 24 hours making it a 3-day course. In addition to the asynchronous online discussion activities, we also provided a computer-based learning package for students to learn design guidelines for audio and animation. In 2011, we further shortened the face-to-face time from 24 hours to 20 hours making it a two and a half day course [3]. The other 19 hours were e-learning activities that included asynchronous online discussion, computer-based learning online sessions, and "Skype" synchronous online consultations. In 2013, we added the use of blogs as one of our e-learning activities. An overview of the pedagogical approach of the course is summarized in Figure 1.

The purpose of this paper is to share how we adopted the "First Principles" of instruction into a blended learning context. The blended learning approach refers to using face-to-face tutorial and e-learning activities. E-learning activities include asynchronous online discussions, synchronous online discussions and reflection blog activities.

1.2 The "First Principles of Instruction"

The "First Principles of Instruction" were originally articulated by David Merrill after reviewing several instructional design theories. Essentially, the "First Principles of Instruction" are a set of prescriptive design principles that are common to the various instructional design theories regardless of their theoretical or philosophical orientation [1].

The "First Principles of Instruction" are founded on three main premises [4]. First learning will be enhanced in direct proportion to the implementation of the "First Principles". Second, the "First Principles" can be implemented in any Instructional delivery system. Third, the "First Principles" are design oriented instead of learning oriented which means that they are used to create learning environments and products rather than explaining how learners acquire knowledge and skill. The "First Principles of Instruction" include the following [1]: (1) Learning is promoted when learner are engaged in solving real-world problems, (2) Learning is promoted when existing knowledge is activated as a foundation for new knowledge, (3) Learning is

promoted when new knowledge is demonstrated to the learner, (4) Learning is promoted when new knowledge is applied by learner, and (5) Learning is promoted when new knowledge is integrated into the learner's world. Table 1 describes in more detail each of the principle.

Table 1. "First Principles of Instruction" (summarized from [1], pp. 45-50)

Instructional Principles	*Corollary*
• Learning is promoted when learner are engaged in solving real-world problems.	• *Show task:* Learning is promoted when learners are shown the task that they will be able to do or the problem they will be able to solve as a result of completing a module or course. • *Task level:* Learning is promoted when learners are engaged at the problem or task level, not just the operation or action level. • *Problem progression:* Learning is promoted when learners solve a progression of problems that are explicitly compared to one another.
• Learning is promoted when existing knowledge is activated as a foundation for new knowledge.	• *Previous experience:* Learning is promoted when learners are directed to recall, relate, describe, or apply knowledge from relevant past experience that can be used as a foundation for the new knowledge. • *New experience:* Learning is promoted when learners are provided relevant experience that can be used as a foundation for the new knowledge. • *Structure:* Learning is promoted when learners are provided with a structure or encouraged to recall a structure that can be used to organize the new knowledge
• Learning is promoted when new knowledge or skill is demonstrated to the learner.	• *Demonstration consistency:* Learning is promoted when the demonstration is consistent with the learning goal: (a) examples and nonexamples for concepts, (b) demonstrations for procedures, (c) visualizations for processes, and (d) modeling for behavior. • *Learner guidance*: Learning is promoted

Table 1. (*Continued*)

	when learners are provided appropriate learner guidance including some of the following: (a) learners are directed to relevant information, (b) multiple representations are used for the demonstrations, or (c) multiple demonstrations are explicitly compared. • *Relevant media:* Learning is promoted when media play a relevant instructional role and multiple forms of media do not compete for the attention of the learner.
• Learning is promoted when new knowledge is applied by learner.	• *Practice consistency:* Learning is promoted when the application (practice) and the posttest are consistent with the stated or implied objectives: (a) information-about practice—recall or recognize information, (b) parts-of practice—locate, and name or describe each part, (c) kinds-of practice—identify new examples of each kind, (d) how-to-practice—do the procedure and (e) what-happens practice—predict a consequence of a process given conditions, or find faulted conditions given an unexpected consequence. • *Diminishing coaching:* Learning is promoted when learners are guided in their problem solving by appropriate feedback and coaching, including error detection and correction, and when this coaching is gradually withdrawn. • *Varied problems:* Learning is promoted when learners are required to solve a sequence of varied problems.
• Learning is promoted when new knowledge is integrated into the learner's world.	• *Watch me:* Learning is promoted when learners are given an opportunity to publicly demonstrate their new knowledge or skill. • *Reflection:* Learning is promoted when learners can reflect on, discuss, and defend their new knowledge or skill. • *Creation:* Learning is promoted when learners can create, invent, and explore new and personal ways to use their new knowledge or skill.

The effectiveness of the "First Principles of Instruction" was examined in a study undertook by Thompson/Netg, a company that offers learning solutions for individuals, businesses and institutions [4]. Using a three-group experimental design, the investigators found that the group which received instruction developed based on

the "First Principles" scored the highest scores than the other two groups. All differences were statistically significant beyond the .001 level. Further, the "First Principles" group managed to complete three authentic Excel tasks in the shortest time (29 minutes), compared to the group that received the existing commercial version of the company's Excel course (49 minutes), while most of the control group (without any prior instruction in Excel) failed to finish the tasks. These differences are also statistically significant beyond the .001 level.

In Merrill's book [5], he identified a few other studies [6][7][8] which suggested that the use of 'First Principles of Instruction can improve the effectiveness, efficiency, and learner engagement when compared with other forms of instruction.

In Session 2, we will identify the instructional activities of our blended learning course that were derived from the five principles.

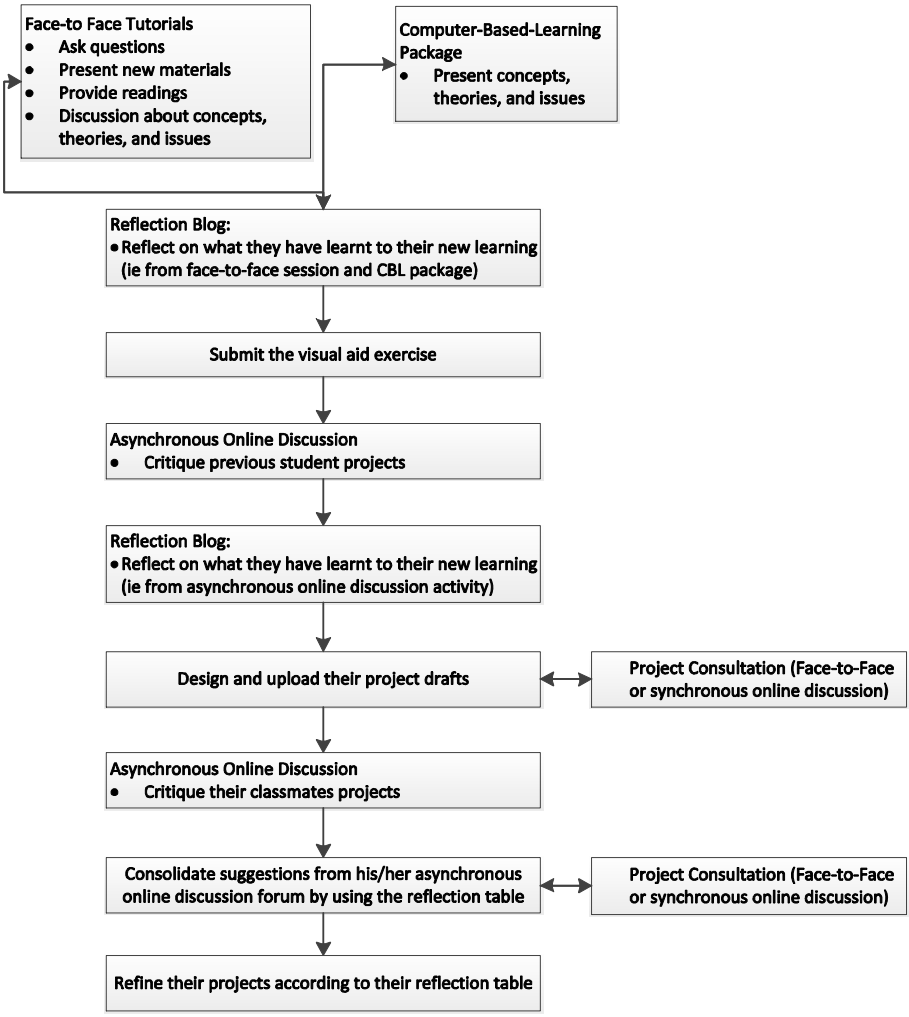

Fig. 1. An overview of the pedagogical approach of the MAIDT course

2 Instructional Activities involved the Blended Learning Approach

In the blended learning approach, we identified the instructional activities that support each instructional principles suggested by Merrill. Some of them were in

Table 2. Instructional activities identified to support the blended learning approach

Instructional Principles	Instructional Activities
• Learning is promoted when learner are engaged in solving real-world problems	• Instructor uses real-world examples to illustrate good and bad multimedia design. (F2F, CBL) • Previous student projects are shown to the learners for them to critique according to the visual design principles and multimedia design guidelines. (F2F, AOD) • Students need to get feedback about their projects from the instructor and classmates (F2F,AOD,SOD)
• Learning is promoted when existing knowledge is activated as a foundation for new knowledge.	• Instructor / CBL begins with students' existing knowledge before he presents the new knowledge (F2F, CBL). • In the AOD environment, students usually use their existing knowledge as a foundation for the discussion (AOD). Through the discussion, they may be able to co-construct new visual / multimedia design principles. • In the blogs, students may show how their previous learnings serve as the foundation for their new learning (Blog).
• Learning is promoted when new knowledge is demonstrated to the learner.	• Instructor / CBL usually demonstrates how to improve "poor" multimedia projects by applying the design guidelines (ie new knowledge) (F2F, CBL SOD). • New knowledge may be demonstrated to learners by their peers after having the discussion in the AOD environment (AOD). • Clarify learners' doubts when they ask questions. (F2F, AOD, SOD)
• Learning is promoted when new knowledge is applied by learner.	• Make suggestions to improve others' project (F2F, AOD) • Apply new knowledge in designing their projects (P)
• Learning is promoted when new knowledge is integrated into the learner's world.	• Apply new knowledge in designing their projects (F2F, AOD) • In the blogs, students may show how he / she apply the new knowledge into their design. (Blog)

F2F	Face-to-Face Environmen
CBL	Computer-Based Learning package (ie interactive multimedia learning software)
AOD	Asynchronous Online Discussion Activity (ie It is not a real time activity. Individuals can login an online discussion forum anytime and anywhere) [9]
Blog	Reflection Blogs
SOD	Synchronous Online Discussion Activity (ie It is a real time activity. Individuals can be anywhere but they have to login the online discussion system at the same time.)
P	Project Activity (ie Each student has to design a multimedia educational package.)

the face-to-face mode while others were in the e-learning activities. The latter included activities such as blog, asynchronous online discussion (AOD), computer-based learning tutorial (CBL), synchronous online discussion (SOD) such as Skype, project activity. Table 2 summarizes the instructional modes and activities used to support each instructional principle.

2.1 Evaluation of the Blended Learning Approach

The data was collected from an evaluation survey at the end of student course evaluation. We identified two relevant closed ended items and one open ended item from the survey. The two closed items were students' perspectives of the organization of the blended course, and the ability of the blended learning course to engage student learning. The open ended item was to get general feedback from students. There were 18 students involved in the study.

Students seemed to have a positive perspective upon the organization of the blended course (M = 3.8, SD = 0.8). The following students made comments regarding the blended learning approach (ie face-to-face activities, and e-learning activities).

> Student A, "It's blended learning which has provides opportunity for learner to be self-directed. …. Also the CBL (Computer-Based Learning) package was very well done for this module".
>
> Student F, "The instructor always provides his real life past experiences for us to think. He has created a multimedia package for this course for the students to go through during the student's free time. I find that the multimedia package enhances my learning and guides me with my assignment".

Some students made some positive comments about the face-to-face sessions. For example, here are some comments of the face-to-face sessions:

> Student D, "The instructor is passionate and knowledge in the field of his expertise. I have learnt a lot from him. I like the way he teaches and he is very approachable in terms of learning. Overall, I have a good experience learning from him."

> Student E, "He always relates the session with his experience which is useful. Sometimes he tends to repeat. Probably I see this is an important message from him".

Some students also made comments about the e-learning activities. Here are some of the comments.

> Student B, "He (the instructor) has a multimedia package for this course for students to go through during the student's free time. I find that the multimedia package enhances my learning and guide me with my assignment".

> Student C, "The exercise of going through peers' works allows me to be exposed to many various perspectives and the (asynchronous online) discussions provided important information that are transferable to my own learning".

Students have a positive perspective about the ability of the blended learning course to engage student learning (M = 3.7, SD = 0.7). Student D pointed out that "The teachings help the learners to think and learn the subject in depth".

In addition, students also provided some positive comments to show that they valued the use of the real life examples in the sessions such as "linking back of the course to real life", and "sharing of practical life experience". From the above comments, we believe students really value the principle, "Learning is promoted when learners are engaged in solving real-world problems [1].

Student A also pointed out that "the visual aid exercise is a good practice for learners to understand the basic multimedia". This indicates that Student A did support the principle, "Learning is promoted when new knowledge is applied by the learner" [1].

3 Conclusion

We converted a face-to-face course to a blended learning course. The conversion process takes many cycles for us to reach the current blended learning model. It is a blended learning model for solving design problems.

In this paper, we share the organization of the blended learning course and how we use the "First Principle" of Instruction to design instructional activities for the course. According to our survey study, it seems students liked the organization of the blended learning course. They also tended to agree that the instructional activities could engage them in their learning. This implies that the "First Principle" of instruction may be a good guideline for instructors to design blended learning courses.

However, we also learned two key points regarding applying "First Principles of Instruction" in a blended learning course. First, the "First Principles of Instruction" can be applied in most of the disciplines and / or various learning outcomes. Second, the "First Principles of Instruction" does not provide any actual guideline for instructional designers to decide if the instructional activities should be face-to-face sessions or e-learning activities. Hew and Cheung's evidence-based blended learning book attempts to bridge this gap by identifying and articulating the specific models and instructional strategies to achieve particular learning outcomes [10]. In addition,

Foo's blended learning framework may help instructional designers to make a wise decision [11].

There are several limitations in the current study. First, only a small sample size of 18 students was used. This limits the transferability of the findings reported in this study. Future research should use larger samples of students from various discipline areas to examine the validity of the findings. Second, this study relies mainly on students' perceptual data. It would be useful to examine if students' learning multimedia concepts improved after the blended learning course is completed. Future research could perhaps conduct a randomized experiment using a treatment group (Merrill's First Principles) and a control group to test the effectiveness of the First Principles of Instruction.

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