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Developing an Interactive Online Learning Environment for Post-Graduate Learning

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Abstract: The proposed online learning environment is under development for a post-graduate course by following the educational design research (EDR) approach. The developmental process will progress through three phases: preliminary research, prototyping, and assessment. In the preliminary research phase, needs and context analyses, a review of literature, and the development of a conceptual framework have been accomplished. Three rounds of iteration will be carried out in the prototyping phase. Each round focuses on pedagogical, social and technical designs. Ten topics will be developed and added to each round. Through appraisals of invited experts and formative evaluation from the participants in each cycle, comments and suggestions will be collected and synthesized, and revision decisions will be generated and incorporated into the next prototype. Design principles are to be summarized. In the final assessment phase, students will be using the online learning environment to test its effectiveness. This paper describes the conceptual framework and design ideas for the development of the online learning environment.

Keywords: Online course, educational design research, interaction, pedagogical design, social design, technical design

1. Introduction

Positive results are frequently reported in literature when purely online learning is compared with face-to-face instruction. For instance, Means, et al. (2010) identified that students in online learning conditions could perform modestly better than those who learned the same materials through face-to-face instruction after conducting a meta-analysis of 27 evidence-based research studies. However, they stated that the reasons for this favorite result to online learning was not because of the use of technology but because of the new pedagogical approaches associated with online learning and more time students spent in the online learning process. Their finding is echoed by some academic leaders who rated online learning outcomes 'as good as or better' than those of face-to-face instruction (Allen & Seaman, 2013).

Purely online learning is also often compared with blended learning in literature. As a combination of face-to-face and online learning, blended learning is commonly considered as an optimal choice for instruction as it has the potential to supplement with each other and overcome the limitations of face-to-face or online learning alone. Nevertheless, existing empirical research studies comparing purely online and blended learning conditions have found no significant difference in students' learning outcomes (cf. Larson & Sung, 2009; Means, et al. 2010).

Existing research seems to suggest that purely online learning could be as good as blended learning, and modestly better than face-to-face learning. However, the commonly reported benefits of online learning such as enhanced learning performance (Means, et al, 2010), increased critical thinking (Wang & Woo, 2010), or improved student-teacher relationships (Mazer, Murphy, & Simonds, 2007) do not occur automatically in any online learning environment. Instructional design and implementation play a critical role in making an online learning environment effective (Kirkwood & Price, 2005). This paper presents a proposal for developing an interactive online learning environment with features of interactive content, rich classroom climate, high social presence of participants, and active participation.

2. Literature Review

The interactive online learning environment would be pedagogically, socially and technically designed for the post graduate students in the context of NIE. In this section, the PST model focusing on pedagogical, social, and technical designs as shown in Figure 1 which guides the design of the online learning environment will be elaborated.

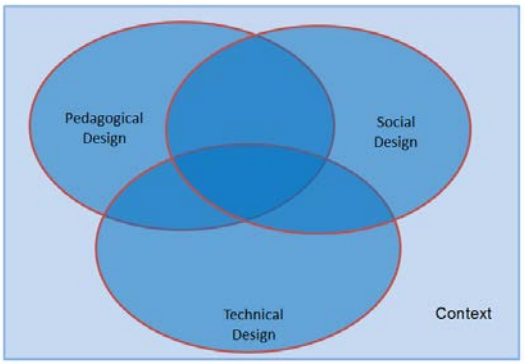

Figure 1. The PST model for online learning environment design

2.1 Pedagogical design

Pedagogy refers to the teaching strategies, techniques, or approaches that teachers use to deliver instruction or facilitate learning. An online learning environment must firstly support and satisfy the needs and learning intentions of students with different learning abilities or backgrounds by involving a variety of pedagogical approaches, learning resources and activities (Kirschner, et al, 2004). Van den Akker (2009) proposed a curricular spider web model, which consists of nine axes representing the important components of a curriculum. These axes are equally important and each chain is as strong as its weakest link. These axes present the key pedagogical design components of an online learning environment.

2.2 Social Design

With the rapid development of technology such as social media and video conferencing technology, social activities become more convenient and flexible through the support of technology. The social design of an online learning environment must provide a safe and comfortable space, in which students are willing to share and communicate with their peers and the instructor. The following guidelines suggested in literature can guide the social design of an online learning environment. There must be clear ground rules and regulations for smooth communication to take place (Anderson, 2004). Such rules may include netiquette, respect for others' opinions, and use of proper language. The environment should support both synchronous (e.g. chat) and asynchronous (e.g. discussion forum) communication (Wang, 2008). Also, it should allow users to communicate in their preferred media (Han, 2013). For instance, some students may like to communicate in written text, while others may prefer using audio or video to interact. A comfortable online learning environment should allow students to decide in which media they communicate. In addition, an online learning environment must get students feel safe. Some strategies include that it can be open to those invited only; enable students to decide who can join the environment; and allow users to edit or remove the messages that have been posted earlier.

2.3 Technical Design

The technical design becomes more prominent for an online learning environment, for many learning activities are conducted online through the support of technology. An online learning environment must be available all the time and the access must be convenient and fast enough (Salmon, 2000). Availability and ease of access are initial requirements for an online learning environment. User

interface design is also crucial as it determines the usability of a computer program. The interface design ought to focus on ease of learning, ease of use, and aesthetics (Wang, 2008). Ease of learning is critical for beginner users while ease of use becomes more important while users gain experience over time. The user interface must be attractive so that it can motivate and engage learners.

2.4 Context

Learning is always taking place in a context, either physical (e.g. a classroom) or virtual (e.g. a discussion forum). Educational designs must address the affordances and limitations of the context in which they will be implemented (Anderson, 2008). Otherwise, a theoretically sound learning environment may not function well in an authentic context. For instance, Skype is a useful technology tool for social communication. However, in a context where the Internet speed is slow, an online learning environment designed based on the affordances of Skype could not work as expected.

The context also affects the way that social interactions occur. For instance, as Asian students are usually shy and introverted, they often prefer text-based or voice-based discussions to video-based conferencing (Yamada, 2009). In addition, if English is not their native language and when their language competency is low, they often prefer asynchronous discussion to synchronous chat when they are required to discuss in English (Thompson & Ku, 2006). The design of an online learning environment must take the context into careful consideration. Without the deliberation of a context, a pedagogically, socially, and esthetically designed learning environment may not work meaningfully.

3. Design

3.1 Challenges and strategies

The success of any online learning depends on how sound its instructional design and implementation are. Challenges faced by teachers in the processes of instructional design and implementation of interactive online learning environments often include limited interactive contents (Means, et al., 2010), lack of classroom climate (Lyons, Reysen, & Pierce, 2012), difficulties in monitoring students' participation (Kear, Chetwynd, Williams, & Donelan, 2012), and limited understanding of students' technological self-efficacy (Lyons, Reysen, & Pierce, 2012).

To address the abovementioned challenges faced by teachers, it is necessary to understand what characteristics a well-designed online learning environment should have and what appropriate strategies must be applied to achieve that. Hence this project aims to answer the following question:

What are the characteristics of an interactive online learning environment that is designed for the purpose of addressing the challenges faced by teachers?

Table 1 shows a tentative list of proposed strategies and their characteristics. They are not exhaustive and additional strategies would be added along with the project developmental stages. Also, the strategies that are confirmed ineffective or useless in the given context will be removed. Through the design research approach, a list of strategies for guiding the design of online learning environments would be summarized and presented in design principles.

Table 1: Challenges and proposed strategies

Challenges	Strategies	Description
1. Limited interactive content	1a. To develop more interactive resources 1b. To provide proper learner control	- More interactive learning objects such as simulations or interactive quizzes can be added - Student have opportunities to explore, play and manipulate the interactive content

	(Pedagogical design)	- Students are encouraged to add learning materials - Learners can highlight, annotate, bookmark resources
2. Lack of classroom climate	2a. To use live video conferencing 2b. To involve synchronous communication (Social design)	- Students and students, and students and the teacher can see and talk to each other - Students and the teacher have real-time interactions - They can communicate via video, audio, or text
3. Difficulty in monitoring students' participation	3a. To observe students' live video 3b. To regularly check students' understanding 3c. To monitor students' postings frequently (Pedagogical & Social designs)	- The instructor can observe the body language or gesture of all or selected students - The instructor can talk to the whole class - The instructor asks questions or initiates discussions frequently - All can post and read messages, and give comments - The instructor pays close attention to the posts
4. Limited understanding of students' technological self-efficacy	4a. To use familiar technologies tools 4b. To provide familiarization or training sessions (Technical design)	- They do not have technical difficulties in using the tools - They are feeling comfortable and confident in using the tool - The tool is easy to establish and access

3.2 Implementation Plan

This development project starts with developing an online learning environment for a post-graduate course entitled "Technologies as cognitive tools" at NIE. Currently this course is conducted mainly in a face-to-face manner supported by the learning management system Blackboard. Blackboard is a useful LMS which allows teachers to create courses, make announcements, upload documents, and send mass emails to some participants or the whole class. However, it has outstanding limitations. It is a rather closed system which allows enrolled students to access only. Also, students are usually no longer allowed to access the course after their graduation. Furthermore, Blackboard is mainly designed for teachers to supplement their face-to-face instruction rather than for students to self-directedly learn the course by interacting with peers or with the teacher. It runs twice in a year: one during the normal semester and the other in between two consecutive semesters, also called the "inter-semester". For the former, it runs once a week for 13 weeks including 11 face-to-face and 2 online sessions. Each session lasts for 3 hours. For the latter, it runs for 6 days spread over two weeks including 5 days of face-to-face and 1 day of online learning. Students from the course are mostly part-time adult learners from either mainstream schools or industries. Due to heavy workload or family matters, they often expect more sessions to be conducted online.

This development project aims to develop an online learning environment which is different from Blackboard in that it is more student-oriented and more interactive. About 75% of the course content (10 topics/sessions) will be redesigned and conducted online, and the rest (3 topics/sessions) will remain face-to-face at the beginning, middle, and end of the course. Similarly, 9 half-days (75%) will be online and the other 3 half-days will remain as face-to-face when the course is conducted in an inter-semester. Keeping some sessions for face-to-face is mainly because the students need to be briefed

about course details at the beginning of the course and thereafter returned to their class to share their perceptions of using the learning environment. Such interaction allows the course to be adjusted promptly in its delivery and organization based on the students' feedback. The last face-to-face session provides an opportunity for them to present their final project, submit assignments and attend end-of-course feedback.

This development project follows the EDR approach and progress through three phases: preliminary research, prototyping, and assessment (Figure 3). In the preliminary research phase, needs and context analyses, a review of literature, and the development of a conceptual framework has been accomplished.

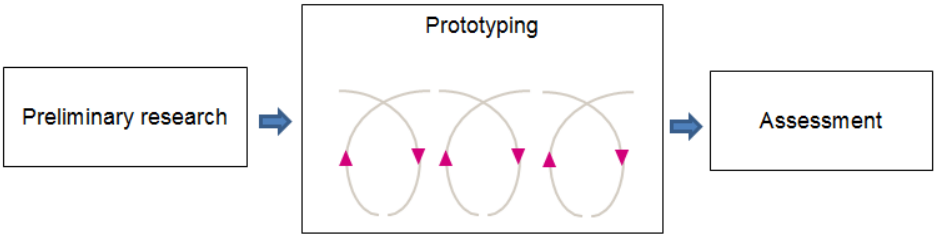

Figure 3. The developmental process

Three rounds of iteration will be carried out in the prototyping phase. Each round focuses on pedagogical, social and technical designs. Ten topics will be gradually developed and added to each round. The formative evaluation of each round and the final assessment phase will be explained in the following section. Through appraisals of invited experts and formative evaluation from the participants in each cycle, comments and suggestions will be collected and synthesized, and revision decisions will be generated and incorporated into the next prototype. Design principles will be summarize and presented.

In addition, there is always a challenge with generalizability in design research. Just as in case studies or experimental studies, the findings of design research cannot be generalized to a larger universe as there is no statistical generalization from sample to population as in the case of survey research (Plomp, 2013). But the 'heuristic' statements of design principles can provide guidance and directions for similar research in the future.

The development of each prototype requires certain technical skills in addition to pedagogical design expertise. Therefore a software programmer is proposed in this project. Tentatively the platform on which the online learning environment will be developed is Adobe Captivate. The programmer must have sufficient competency to use the software and other web page design tools to develop the online learning environment. In addition, the project team members have already attended some training sessions about using e-learning design tools such as Articulate Storyline or Adobe Presenter.

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