The Design of Online Learning Environments from the Perspective of Interaction

Huay Lit Woo

The design of online learning environments is a complicated process because it entails the use of technological tools to mediate the various forms of interaction situated in the learning process. One possible way to help reduce such complication inherent in various forms of interaction is to look at design as a problem-solving activity. This means online design will become an endeavor to minimize design problems and provide solutions to these problems. The process includes considering converting online activities into their face-to-face counterparts, the suitability of affordances and contexts of the chosen tool, and the favorability of users’ perceptions of the tool.

The Challenges of Incorporating Technological Tools in Online Learning Environments

Interaction is key to learning (Horton, 2000; Mason & Rennie, 2008; Oliver & Herrington, 2001; Zwang, 2011). It is also a means by which people constantly make adjustment and learn about their environment (Wilson & Meyers, 2000). This is an important process, especially when the learning is situated in a social setting.

Interaction in a traditional face-to-face learning environment usually involves students, the instructor, and the learning materials, but not in an online learning environment. According to Chou (2003), there are

Huay Lit Woo is a Research Scientist in educational technology at the National Institute of Education, Nanyang Technological University, Singapore. He has taught courses at the higher education level on using ICT to design lessons and has been actively involved in publication. His current research area is designing learning environments using Web-based technologies (e-mail: huaylit.woo@nie.edu.sg).
four types of interaction that can occur when learning takes place via the internet: (1) learner–content, (2) learner–instructor, (3) learner–learner, and (4) learner–interface interactions. These interactions are shown in Figure 1.

Interactions (1) to (3) commonly take place between two parties, with no mediation in between, such as a learner reading a book (via path 1), an instructor talking to a learner (via path 2), or learners discussing a topic in a group (via path 3). But when learning goes online, an additional tool, such as an e-mail application, will be required for communication between an instructor and his/her learners, or a video may be used as a form of subject content, and likewise a discussion forum may become a place for learners to discuss with their fellow students some collaborative assignments. Interaction then is no longer confined to two parties but is conducted via a device that sits in between the two interacting bodies. To do well in such a tripartite situation will require a learner to be well-versed with the interface of the tool; this is a requirement over and above that of a traditional form of learning. This is what Chou describes as the fourth interaction, or the “Learner–Interface” interaction (via path 4). The need to know a tool’s interface imposes challenges not only on learners but also on instructors and designers of the learning environment.

To understand how the inclusion of a tool complicates the learning process, Chou’s ways of interaction are reorganized to have the tool take the centre stage in order to reflect its mediatory role. This is shown in Figure 2.

Figure 2 is called the “Tool-Enabled Interaction” model or simple the “TEI” model. It encapsulates all possible forms of interaction that are available in an online learning environment. The TEI model has the following characteristics:

1. It shows that all interactive processes are mediated by a tool. Therefore, pedagogy alone is not sufficient to determine the success of learning; additional knowledge—how to use the tool to interact—is required.

2. It delineates complexity and allows all possible forms of concurrent interactions to be analyzed independently or collectively. For example, in an online lesson, an instructor is required to explain to a learner a certain concept in an e-book. Based on the TEI model, it shows that three types of simultaneous interactions will be required to support such activity. First is to provide a two-way communication between the instructor and learner via the Instructor–Tool–Learner path; next is to provide a means for the learner to interact with the e-book via the Learner–Tool–Content path; and last is to provide the same means for the instructor to interact with the same e-book via the Instructor–Tool–Content path. Because all tools must be accessible via their interfaces, the TEI model also specifies where these interfaces are and who will access them. For the given example above, the interfaces are indicated in Figure 2 by paths A, B, and C.

3. The TEI model contains an additional interaction path which is not reflected in Chou’s model. This is the Instructor–Tool–Content path, as noted above. This path suggests that an instructor must constantly interact with the content he/she uploaded for online learning, which means the instructor must maintain the currency of the content and the right timing for the content to appear or to be removed. For example, if the content is in the form of a link to a Website, the instructor must ensure that the content which the link refers to will remain active and accessible throughout the course of the online learning; or, if the content is a case study document, it would be appropriate to make the document accessible to students only after they have understood the required concepts—releasing it.
too early may compromise the effectiveness of the learning process. But, very often, the roles and responsibilities for the instructor to manage content are seldom highlighted in most online design literature.

The TEI model exemplifies the fact that designing learning in an online environment is very complex and challenging (Kays & Sims, 2006). The involvement of using a tool to support learning suggests that the usual understanding of human psychology, long known to both instructors and instructional designers cannot be applied directly in the online situation; instead, it calls for additional knowledge—of the Human-Computer Interface (HCI)—that is built on integrating the theoretical bases of human psychology and computer science engineering (Carroll, 1997), to be included in the design process. Hence, online instructional design is indeed a cross-disciplinary field that transcends the art of design to include both pedagogy and technology in a single entity. This is in line with Mishra and Koehler’s (2006) contention that:

Quality teaching requires developing a nuanced understanding of the complex relationships between technology, content, and pedagogy, and using this understanding to develop appropriate, context-specific strategies and representations. (p. 1029)

The knowledge of how pedagogy, content, and technology are to be infused for learning is termed by Mishra and Koehler as Technological Pedagogical Content Knowledge (TPCK, later TPACK). Such knowledge is not something that can be acquired simply by attending training classes or workshops; it requires years of practicing and designing instruction with technology, and very often it is learned through trial-and-error, and sometimes by heuristics. Because of this, designing effective online learning environments remains challenging and demanding.

Designing Online Learning Environments Is a Problem-Solving Activity

Smith and Ragan (2002) call design the “execution of some plan in order to solve a problem” (p. 4). They regard design as a form of problem-solving activity in an ill-structured or ill-defined domain. This is a refreshing idea but quite a departure from traditional views that instructional design is about developing instructional materials and activities to meet the needs of learners (Briggs, 1997, cited in Richey & Nelson, 1996). Designing online activities takes a similar path, but it needs knowledge from multiple disciplines, as specified in TPACK; it is therefore more problematic to design than traditional face-to-face instruction. This view is echoed by Irlbeck, Kays, Jones, and Sims (2006), who see online learning design as a special case of design in the broad sense, in that a designer’s main role is to seek strategies that will provide solutions for problems that are often multifaceted in nature. Hence the notion that design is to solve a problem is very suitable for the case of online design.

Seeing design in this light, online instructional design will provide solutions to the problems found during the designing process. Therefore, the role of a good online instructional designer will be to design online learning environments by reducing possible design problems, both technical and pedagogical, to the minimum. This gives rise to the following considerations.

Online Learning or Face-to-Face Learning?

Nothing beats meaningful interaction when it comes to learning. This has been highlighted in the early part of this article, which is why some schools are beginning to implement “flipped classrooms” as an alternative to the formal face-to-face classroom setting. A flipped classroom is one that “requires students to study course concepts at home and do traditional homework in the classroom” (Robson, 2013, p. 1). It is the reverse of the process of traditional classrooms. Its purpose is to use the face-to-face class hours for students to engage with their peers and teacher to solve problems and to leave the more mundane chores of reading textbook materials at home. The important message of such a practice is that learning will be more meaningful if planned activities can contain components to allow learners to interact actively with their peers and for their teacher to scaffold their learning (Jonassen, 2000). This gives rise to considerations for allowing some of the highly interactive activities with high degrees of scaffolding originally designed for an online environment to be done in a face-to-face setting. In other words consider “flipping” activities in the online setting to the face-to-face setting.

But the decision to “flip” a class or not will need careful consideration. The use of the TEI model will be useful in this respect. Based on the TEI model, highly interactive activities such as collaboration will need to use tools that can support multiple interaction paths between instructor and learners, learners and learners, instructor and content, and learner and content. This is absolutely a complex situation not only in that it involves all the interactions depicted by the TEI model, but also the various forms of interface that all participants in the collaborative processes must know. Hence, given the axiom that to design is to solve problems, as explicated in previous sections, it would be prudent to make instructional decisions based on the criterion of “least problems,” meaning that a tool chosen to support an activity should be the one that has the least problems to solve.

As a rule of thumb, if an activity requires multiple independent platforms to engender interactions, such as using Skype (http://www.skype.com/en/) for communication and at the same time using Adobe PDF
Reader for accessing documents and Google Groups (http://groups.google.com) for group discussion, then learners are likely to be overwhelmed by the many types of interface that they have to handle, and the learning experience will likely be frustrating. For such a case, it will be more appropriate to use a full-fledged Learning Management System (LMS) such as BlackBoard (http://www.blackboard.com) that has functions to integrate all the tools mentioned earlier into a single platform. However, it is understood that not all online course providers will adopt LMS; under such a situation, it would be worthwhile to consider turning the activity into a face-to-face activity and to give the tools a miss altogether. But what about activities that need only a single tool or a tool that is not too complicated to handle? Such a situation is not uncommon to individual offering a co-editing feature for members of a team to set of considerations, which will be discussed in the following sections.

Affordances of the Tool

Every tool relies on a certain technology to build; therefore, it has limitations in terms of affordances. Affordance is a term used to describe how well a tool provides opportunities for a user to take action (Kirschner, Strijbos, Kreijns, & Beers, 2004). For instance, a generic wiki tool like PBWorks (see http://pbworks.com) is often used for collaborative works by offering a co-editing feature for members of a team to co-write articles and share documents. But it falls short of providing a "threaded" platform for members to discuss in a formal way. This could be so because the affordances of PBWorks are built on the notion of distributed cognition rather than discourse for knowledge construction. However, if the activity requires discourse learning, then perhaps an online discussion forum will serve the purpose better, because its threaded function can help trace the interactions of the students' postings and thus the development of any new ideas. Hence, each tool has its specific use and renders only limited flexibility; this means the tool may restrict certain pedagogies rather than enhance the pedagogies. As such, online instructional designers need to strike a balance between affordances and constraints (Ryder & Wilson, 1996).

Perception of the Tool

Not all learners are comfortable with using technology for learning. According to Hiltz and Turoff (2005), there are on average about 10% to 20% of students who will prefer the face-to-face environment to online learning because "they believe they learn best in that [the former] environment" (p. 61). In other words, believers in face-to-face learning have low perceptions of the value of technology tools; this is detrimental to the success of online learning. Indeed, perception is a very important element in learning, because all learning is presupposed by a learner's prior experience, and it is this prior experience that determines the meaningfulness of the activity that the learner is going through (Slavin, 1997).

In the case of online learning, if a learner already has a negative perception of a particular tool, or a form of activity using that tool, then the meaningfulness of the tool and the activity will be lost as a result, and the extent of learning will be compromised. Therefore, in designing online activities, one must consider the learners' perceptions, not the perceptions of the designers, which are often mistakenly assumed to be the priority.

Context for Using the Tool

Learning is a form of human activity, and all activities are either situated in a context or are context-related (Nardi, 1996). Learning activities therefore must be designed with a context in mind (Woo & Wang, 2009). Psychologists have stressed that conditions under which learners partake in their learning activities have great impacts on how they apply the learning later. If the situation for application is similar to the situation of learning, then transfer of learning takes place easily; otherwise, transfer will be met with difficulties (Schunk, 2000). In the same vein, cognitive theorists also have found that mood can similarly affect the extent of how information is recalled from memory. When the mood at the time of learning is very different from the mood at the time of testing, then recall performance will be impaired (Foster, 2009). All of these have implications for the tools used in learning.

Using a technological tool is very different from using an ordinary tool in our daily lives. A technological tool, by virtue of its design, often requires some forms of protocol to get it to work (a technological tool here refers to a tool that is enabled by a computer). But these protocols are for the computer, and are often either different or not required for human-to-human interactions. For example, conversations within a group in real life can happen in a form of turn-taking or one-to-many or both, depending on the needs of the circumstances. The participants can also express feeling through gestures or body language. But in an Asynchronous Online Discussion (AOD) environment, conversation is threaded and dialogue is serialized, meaning that a participant must always place his/her message within a certain thread and below a certain posting, even though the message is to address a few people from different threads. Furthermore, the text-based conversation engendered by the AOD also forbids other intangible information, like mood and feeling, to be displayed along with the text, despite the fact that this shortcoming may be compensated for by using emoticons to denote the state of emotion. The effect, however, is still weak and unnatural. Hence, learning with a technolog-
tical tool requires a clear view of the possible context it brings about (Mason & Rennie, 2008) so that the tool will not produce a context which is far from what is intended; otherwise, it can become a hindrance rather than an enabler of learning.

The Way Forward

Online learning will continue to be an important player in education for years to come. This is due to the strong support of new technologies and the global demands for workers to be well-versed in 21st Century tools and skills. But not all technologies are applicable for use in education, even if some of them have revolutionary impacts on lives, and they affect the way people do things, such as the impacts caused by smartphones and Facebook.

Smartphones have made human connectivity possible anytime and anywhere; likewise, Facebook updates information about friends regularly, making socialization much easier. These technologies are designed to enhance humans’ sociality, and they employ a common tactic, that is, they increase the interactivity between the device and the user and hence the interconnectivity between other users in the group. Increasing tool interactivity appears to be a common trend.

Increasing tool interactivity for devices looks promising, but it has repercussions for online learning designers. It means users will have to learn new ways of operating these devices, and there must be provision for the devices to work in tandem with each other. Both of these conditions impose new learning curves for the learners and a new understanding of pedagogies for the instructors. Consequently, it is difficult to design online activities using these devices independently as tools. The way to go probably favours the use of integrated systems, like customized LMSs, which have tools built into a shared interface, with their functions interoperable. This is exactly what is happening in many universities around the world, and the phenomenon is expected to continue for some time.

References


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