Maximizing Collaborative Processes in Blended Learning: TSOI Hybrid Learning Model

Mun Fie TSOI
Natural Sciences & Science Education, National Institute of Education Singapore, Nanyang Technological University, Republic of Singapore raymond.tsoi@nie.edu.sg

Abstract- Research on the nature of collaboration in blended learning has led to a variety of methodologies to the practice of blended learning. As such, this paper provides an alternative practice model, the TSOI Hybrid Learning Model to maximize collaborative processes in blended learning. The Piagetian Science learning cycle model and the Kolb’s experiential learning cycle model are used to conceptualize the theoretical framework of this model. This learning model which is research evidence-based represents learning as a cognitive process in a cycle of four phases: Translating, Sculpting, Operationalizing, and Integrating. An essential feature is to promote active cognitive processing from inductive to deductive in the learner for engaged and meaningful learning and also addressing the learner’s individual learning style. An authentic blended learning example illustrating the hybrid learning model application on understanding multimedia learning for pre-service teachers is provided. This hybrid learning model steers the design of the blended learning activities involving participatory learning and asynchronous virtual collaboration tools such as blog and wiki. Collaborative outcomes and implications will be discussed in the context of collaborative learning in science education.

Keywords- Blended Learning, Hybrid Learning Model,

INTRODUCTION

Research on the nature of collaboration in blended learning has led to a variety of methodologies to the practice of blended learning. Besides, there is also a lack of research of the application of the learning models such as Jarvis’s model of reflection and learning as well as the more popular Kolb’s experiential learning cycle model to the development of instructional materials for not only e-learning but also blended learning (Lisewski & Joyce, 2003; Oliver, 2002). Thus, having this in mind, an alternative practice model, the TSOI Hybrid Learning Model™ & © 2005 All rights reserved (TSOI HLM) is proposed for both effective design and pedagogical practice of blended learning in the area of collaboration.

Conceptual Framework of TSOI Hybrid Learning Model (TSOI HLM)

The conceptual framework of the TSOI HLM is an evolution from the Piagetian Science learning cycle model and the Kolb’s experiential learning cycle model. The term hybrid will mean the mixing of two different things to give a better product which in this case is a learning model that is pedagogically more innovative and comprehensive than each of the original model. The Piagetian Science learning cycle model being inquiry-based represents an inductive application of information processing models of teaching and learning (Karplus, 1977; Lawson, 1995; Renner & Marek, 1990). It has three phases in a cycle: exploration, concept invention, and concept application as shown in Figure 1. The exploration phase focuses on “What
did you do?” while the concept invention phase places emphasis on “What did you find out?”. The concept application phase entails the application of the concept.

Figure 1. The Science learning cycle model

The Kolb’s experiential learning cycle (Kolb, 1984) as shown in Figure 2 represents learning as a process in a cycle of four stages, namely, concrete experience, reflective observation, abstract conceptualization, and active experimentation. The concrete experience stage is about “doing” while the reflective observation stage concerns the “understanding the doing”. The abstract conceptualization stage focuses on the “understanding” part and the active experimentation stage is about “doing the understanding”. The core idea in the Kolb’s experiential learning cycle is that learning requires both a grasp or figurative representation of experiences and some transformation of that representation. (His & Agogino, 1994; Tsoi & Goh, 1999; Van Aalst et al., 1995).

Kolb also created four quadrants in his model of experiential learning. He named each quadrant a learning style as diverger, converger, assimilator or accommodator (see Figure 2).

The TSOI Hybrid Learning Model™ & © 2005 All rights reserved., represents learning as a cognitive process in a cycle of four phases: Translating, Sculpting, Operationalizing, and Integrating (Tsoi, 2008a; 2008b; 2007; Tsoi et al., 2006; 2005) One foremost facet is to support active cognitive processing in the learner for meaningful and engaged learning proceeding from inductive to deductive learning. Besides, it is inclined towards constructivism. Figure 3 shows the four phases of this learning model.

TSOI Hybrid Learning Model (TSOI HLM) as an Alternative Practice Model

The Translating phase is similar to the exploration phase of Science learning cycle model and the concrete experience stage of Kolb’s experiential learning cycle model. It emphasizes concept initial exposure for preliminary experience. The instructional learning activity though general in nature is designed to have an initial relationship to the principle underlying the concept which is to be further engaged in the second phase, the Sculpting phase.

The Sculpting phase emphasizes concept construction for its critical attributes. The Sculpting phase parallels the concept invention phase of Science learning cycle model and predominantly the reflective observation stage of the Kolb’s experiential learning cycle including partially the abstract conceptualization stage of the Kolb’s experiential learning cycle.

The Operationalizing phase is similar to predominantly the abstract conceptualization stage of the Kolb’s experiential learning cycle and it emphasizes concept internalization for its meaningful functionality. This important phase is crucial.
as it serves as the vital bridge connecting the Sculpting phase and the Integrating phase for not only concept formation but also concept internalization in which all the critical attributes of the concept are linked together for meaningful functionality. During the fourth phase, the Integrating phase, the just learned concept is applied to new situations as well as is integrated in different contexts in order for meaningful learning to occur. The Integrating phase emphasizes concept application for meaningful transfer of knowledge. It parallels the concept application of Science learning cycle model as well as the active experimentation stage of Kolb’s experiential learning cycle.

**Design for collaborative processes in blended learning (Translating phase)**

A real-life example on understanding multimedia learning design in an e-learning environment for pre-service teachers of the PGDE (S) course (Postgraduate in Diploma in Education, Secondary) is used to illustrate the design for maximizing collaborative processes in blended learning using TSOI HLM as an alternative practice model.

In the Translating phase, face to face interactions are carried out in 2 sessions of 2 hours each in the form of group discussion using cooperative learning strategies such as think and pair share, number heads together and round table. For example, responses to a question on “what do you understand by the term multimedia learning” are elicited and discussed. The idea is to give an opening experience as to what does multimedia learning mean to them thereby having a beginning idea of this term. The next activity involves understanding of multimedia learning design principles (Mayer, 2001) followed by the fundamentals of TSOI HLM as the focal point for design to prepare the trainee teachers for the Sculpting phase.

In chemistry education, stoichiometry, a difficult topic due to its abstractness is used (Tsoi et al., 1998) to illustrate the understanding and applications of the hybrid learning model. One of the subtopics used is molar volume and molar mass. This next section will provide insights on the design application of the TSOI HLM in multimedia learning.

**Design for collaborative processes in blended learning (Sculpting phase)**

There are 2 components to accomplish for e-learning namely, the molar volume and molar mass multimedia learning module, and use of blogs. The molar volume and molar mass multimedia learning module involves the learning of the following concepts namely Avogadro’s law; molar volume; and molar mass. A quantitative relationship between the mole and the volume of gas at room temperature and pressure is to be acquired. The module consists of four instructional learning episodes in accordance to the four phases of the TSOI HLM. These four instructional learning episodes are (a) Investigating gaseous reactions, (b) Relationship between mole and volume of gas, (c) Stoichiometry calculations, and (d) Gas stoichiometry problems.

The translating phase is illustrated to show part of the TSOI HLM since the focus is not on designing the multimedia learning module. Three activities in the Translating phase “Investigating Gaseous Reactions” are designed in accordance to the pedagogical design principles of the Translating phase of the TSOI HLM to explore the relationship between equal volumes of all gases and the number of particles. The multimedia experiences are translated into a beginning idea or concept of equal volumes of all gases containing the same number of particles which is considered basic and essential to understand molar volume in the second phase, the Sculpting phase. This takes place as a chain of logical events of content sequencing, learner guiding and reflecting in which active learning processes are involved as well. Findings from relevant research studies on the teaching and learning of stoichiometry (BouJaoude & Barakat, 2000; Dori & Hameiri, 2003; Sanger, 2005) are also taken into consideration in the design of the activities. Part of screenshot for
designing multimedia learning that is meaningful and engaging is illustrated (see Fig 4).

During the first activity, the learner is given a general chemical equation for placing the correct number of flasks of equal size for the general chemical reaction of the ratio 1:1:1 in terms of one reactant reacting with another one reactant to give one product.

This is then progressed to a second activity involving another general chemical reaction also of the ratio 1:1:1 in terms of one reactant reacting with another one reactant to give one product. However, this general chemical reaction is represented at the particle level. The question “What have you observed in terms of volume and number of particles?” is posed. The rationale is engaging the learner to use one’s observation skills and process the information cognitively with the aim of looking for a pattern relating the volume of the flasks of equal sizes and the number of particles in the flasks. This is further engaged into the third activity that involves another general chemical reaction of the ratio 2:1:1 in terms of two reactants reacting with one reactant to produce one product. Essential question for example “How are your observations for this reaction like the observations you made previously? is posed. The purpose is to elicit cognitive observational responses as a result of using thinking skills of abstracting and comparing by the learner. The response will be “I have observed that equal volumes of all gases contain the same number of particles”. The learner needs to grasp and master this essential relationship for understanding molar volume.

In essence, knowledge is built throughout the instructional learning activity on these two general chemical reactions involving gases only that progresses from a simple type, $A + B \rightarrow C$ to a complex type, $2E + G \rightarrow D$. This is designed for the learner to experience the multimedia learning activities and formulate cognitively that equal volumes of all gases contain the same number of particles and that the stoichiometry of a chemical reaction is not addictive in nature.

This beginning idea or concept of equal volumes of all gases containing the same number of particles as Avogadro’s hypothesis experienced in the Translating phase will be built upon in the second phase, Sculpting phase of the TSOI HLM, to expand to a relationship between the mole and the volume of gas.

Figure 4. Molar Volume and Molar Mass Multimedia Learning Module (Translating phase)
Maximizing Collaborative Processes in Blended Learning: TSOI Hybrid Learning Model

The individual will observe how the multimedia learning module is developed based on the TSOI HLM and reflect on it using a reference article. After that, the group will collaborate using the blog tool to discuss their observations and give a summary. The understanding of the hybrid learning model is constructed here besides the meaning of multimedia learning design principles. A sample of blog is shown in Figure 5.

**Design for collaborative processes in blended learning (Operationalizing and Integrating phase)**

In the Operationalizing phase, the Wiki tool is used for internalization. The individual is asked to reflect and provide up to 6 points its implication on teaching and learning of chemistry as well as think & describe briefly of how you as a teacher can apply this hybrid learning model as a practice framework to guide you in your teaching of chemistry concepts. Figure 6 shows part of the wiki.

**Name removed’s Reflection and Application (CS2) (permalink)**

last edited by name removed on Tuesday, 04/16/2009 1:02 AM

**Reflect & provide up to 6 points on its implications on teaching and learning of chemistry:**

- Prior knowledge of students is taken into consideration so as to help link the new knowledge with the old one. This also allows the teacher to correct any mis-conceptions the students may have.

  **Think & describe briefly of how you as a teacher can apply this hybrid learning model as a practice framework to guide you in your teaching of chemistry concepts.**

  - Next, I will bring in animations of the concept, which can introduce the students to the concept at a slightly difficult level. This animation will also help engage the students and interest them to learn more about the concept.
  - Lastly, I will allow students to reflect upon what they have learnt to ensure that they have thought through and assimilated the new knowledge with the old one.

**DISCUSSIONS**

Though the design of the research is not that of an experimental approach, the outcomes of the collaborative processes involved as reflected in the contents of the blogs and wikis have been positive. Indeed, this sets the stage for studying this alternative way of
maximizing collaborative processes in blended learning. The various instructional activities be it face to face interactions or e-learning are connected within the framework of this practice model for collaborative processes.

In the Translating phase of the TSOI HLM, active learning processes engage the learner during the process of learning. As such, it is essential to first identify the critical attributes of the concept to be learnt so that varied activities can be designed to assist the learner to identify these critical attributes and eventually leading to acquisition of concept mastery. The instructional activities experienced by the learner in the Translating phase should be familiar to the learner so that one can make connections to one’s existing knowledge structures. Following the realization of the Translating phase, the learner’s preliminary experience is then given more meaning in the Sculpting phase.

During the second phase, the Sculpting phase of the TSOI HLM, the beginning concept experienced still in its raw form is logically shaped to a more concrete form by a series of instructional learning activities that are “crafted” meaningfully to assist the learner to identify the critical characteristics or attributes of the concept to be learned. It focuses on concept construction for its critical characteristics or attributes.

There is an important need for the concept that is already constructed to be internalized for meaningful functionality in the Operationalizing phase. Besides, a meta-cognitive approach of the problem solving processes is also established. It emphasizes concept internalization for its meaningful functionality.

During the fourth phase, the Integrating phase, the newly acquired concept already internalized is integrated in different contexts in order for meaningful learning to occur. The Integrating phase emphasizes concept application for meaningful transfer of knowledge.

In this process of collaboration in blended learning, the learner will build on the concrete experience, and will learn how to create knowledge and integrate the knowledge with existing ideas and concepts in other context and more importantly, to be an active learner engaged in the various learning processes. Indeed, the TSOI Hybrid Learning Model has the functional capacity to equip the educator to design blended learning in science education that can engage the learner for collaboration.

REFERENCES


