PAPER PROPOSAL (PAPER IN PROGRESS)

INSTRUCTIONAL PEDAGOGY

TITLE OF PAPER

USE OF CYBERSPACE PROBLEM-BASED LEARNING TO ENHANCE HIGHER EDUCATION

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CHANGING INSTRUCTIONAL PEDAGOGY

The onset of a flu pandemic, unprecedented scale of environmental disasters, terrorism and complex political and social-economic problems all point to the need for education to prepare our students for a rapidly changing and sophisticated world. The ability to learn when plunged into an unfamiliar situation and to adapt positively to rapidly changing demands is a reality for every worker today. People not only need to learn to confront problems as a matter of necessity but they also to develop a positive mindset of observation and taking on "problems" as a matter of inquisitiveness to improve and invent processes and products.

Problem-solving acumen is developed through experience, immersion and intelligent observation to see possibilities and opportunities. Problem solving in real world contexts involves multiple perspectives and multiple ways of knowing and multi-disciplinary learning (Tan, 2003). Cyberspace learning platforms with use of problem-based learning appears to be a promising approach for higher education.

Knowledge in this new economy is also increasingly characterized by the creative integration of information and learning from diverse disciplines. In recent years psychologists, sociologists, anthropologists, scientists, entrepreneurs and researchers from various fields have shed considerable light on the nature of creativity, innovation and enterprise. Education needs to address the challenge of preparing the young to function in changing and new environments.

PROBLEM-BASED LEARNING EFFECTIVENESS

Problem-based learning (PBL) is an active-learning and learner-centered approach where unstructured problems are used as the starting point and anchor for the inquiry and learning process. In recent years, PBL has gained new momentum as a result of several developments such as (i) increasing demand for bridging the gap between theory and practice, (ii) information accessibility and knowledge explosion, (iii) new

possibilities in the use of multidisciplinary problems, (iv) emphasis on real-world competencies, and (v) developments in learning, psychology, and pedagogy (Tan, 2004a).

PBL approaches in a curriculum usually include the following characteristics (Tan, 2003):

- The problem is the *starting point* of learning.
- The problem is usually a *real-world* problem that appears unstructured. If it is a simulated problem, it is meant to be as authentic as possible.
- The problem calls for *multiple perspectives*. The use of cross-disciplinary knowledge is a key feature in many PBL curricula. In any case, PBL encourages the solution of the problem by taking into consideration knowledge from various subjects and topics.
- The problem challenges students' current knowledge, attitudes and competencies, thus calling for identification of learning needs and *new areas of learning*.
- *Self-directed learning* is primary. Thus, students assume major responsibility for the acquisition of information and knowledge.
- *Harnessing of a variety of knowledge sources* and the use and evaluation of information resources are essential PBL processes.
- Learning is *collaborative, communicative and cooperative*. Students work in small groups with a high level of interaction for peer learning, peer teaching and group presentations.
- Development of *inquiry and problem-solving skills* is as important as content knowledge acquisition for the solution of the problem. The PBL tutor thus facilitates and coaches through questioning and cognitive coaching.
- Closure in the PBL process includes *synthesis and integration* of learning.
- PBL also concludes with an *evaluation and review* of the learner's experience and the learning processes.

PBL approaches involve confronting ill-structured situations - situations where we are uncertain about information and solutions - and mastering the art of intuitive leap in the process of resolving the situations. Whilst many instructional designers support the need to develop multiple intelligences, few realize that one of the best ways to draw forth these intelligences is to make use of real world problem scenarios in their e-learning platforms. In PBL the use of problems as triggers of learning is further developed into a learning system with stages as follows: (i) meeting the problem (i.e. problem identification and ownership), (ii) problem analysis and development of learning issues (for self-directed learning, peer teaching and team problem-solving, (iii) discovery and reporting (i.e collaborative inquiry and sharing, (iv) solution presentation and reflection, and (v) overview, integration and evaluation. These stages appear to be a linear progression however several iterations are often needed at the problem analysis and discovery stages.

PBL IN HIGHER EDUCATION

The goals of PBL include content learning, acquisition of process skills and problem-solving skills, and lifewide learning. PBL in education is about the ability to be flexibility in the use of knowledge base, building on prior knowledge and connecting meaningfully to real life situations. Students were also able to relate theory to practice and developed greater ability to remember and re-use what they have learnt. The use of prior knowledge in relation to the problem and is seen as beneficial as students became more confident and are able to use the knowledge gained for practice. It has been found that by reflecting upon prior learning, students are able to analyse and synthesise the contextual information, acquire further knowledge and assimilate it into their existing knowledge base.

Tan (2003, 2004) explained that through PBL cycles students learn to connect information to prior knowledge, prior experience, theory, new facts and ideas, other people's perspectives and the real world context as such this develops their capacity to apply knowledge gained to a variety of problem situations. The development of problem-solving skills and problem-solving acumen are important objectives in PBL. PBL develops problem solving skills by enabling students to transfer the problem solving strategies that were modeled for them in PBL to a similar problem on an related topic. PBL provides a learning environment where cognitive immersion happens. Traditional approaches and didactics often do not provide for opportunities of learning where intuition and insights can occur.

Figure 1 illustrates the key components in PBL approaches.

Problem presentation

Problem triggers inquiry

PBL stages

- Initial analysis

- Generation of learning issues

- Iterations of independent and collaborative problem solving

- Integration of new knowledge
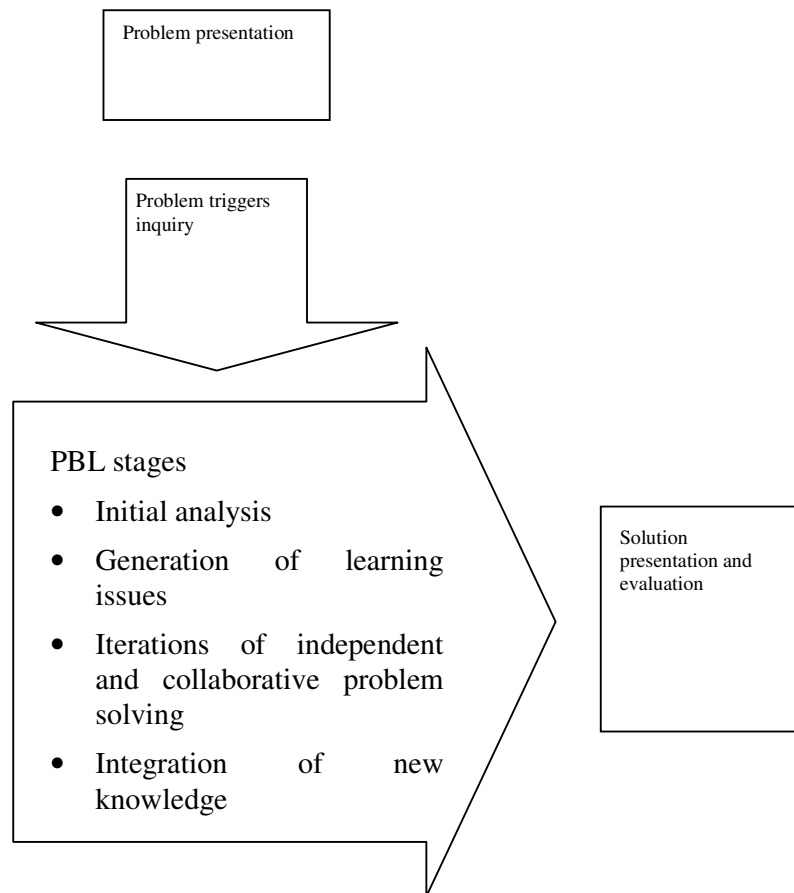
Solution presentation and evaluation

Figure 1: Components of the PBL approach

Problem-based learning architecture typically involves a shift in three loci of educational preoccupation, namely, (i) content coverage to problem engagement, (ii) role of lecturing to role of coaching, (iii) student as passive learners to that of active problem-solvers. Whilst PBL is a promising approach to educational innovation, implementation deficiencies often occur in problem design, facilitation processes and student readiness and preparation. PBL curricula also emphasizes the acquisition of process skills, development problem-solving skills, reflective and evaluative thinking (Tan & Ee, 2004). The hallmark of learning in all of these is the use of inquiry.

CYBERSPACE AND PBL

By using problems as triggers for learning and interactivity, the potential of technology could also be more fully harnessed.

Current e-learning tend to be characterized by
- Changes the mode of delivery
- Passive definition of the scope of learning
- Primarily retrieval of content
- General linear structuring of content
- Little activation of prior knowledge
- Limited engagement
- Single discipline
- Primarily convergent thinking
- One-one communication
- Individual learning
- Little need for information mining
- Little evaluation of information sources

By using PBL in e-learning however we looking at systems characterised by

- Changes paradigm of learning
- Active definition of the scope of learning by participants
- Learning of process as well as content
- Scaffolding of thinking
- Activation of prior knowledge
- Inevitable and enhanced engagement
- Multiple disciplines
- Encouraging connectivity and divergence
- Communication including one–many and many–many
- Peer/Collaborative learning
- Information search that is more extensive
- Emphasizing review and critique of information sources

The e-learning environment is also very conducive for PBL cycles. PBL approaches provide the motivation for online learning engagement in terms of connecting to resources. Some of the underpinning principles of the use of PBL in e-learning are:

- Make use of the power of real-world problems to motivate learning
- Design the learning environment such that it employs the global information network
- Encourage the development of learning-to-learn processes, heuristics, and thinking skills
- Emphasize problem solving and decision making rather than content learning
- Provide for systems of engagement and collaboration
- Provide opportunities for active application of knowledge and self-review
- Optimize the use of flexible structures to support and sustain independence and interdependence
- Develop evaluative and critical use of information sources

Problem solving in real-world contexts involves multiple ways of knowing and learning. Intelligence in the real world involves not only learning how to do things and actually doing them, but also the ability to deal with novelty as well as the capacity to adapt, select and shape our interactions with the environment.

The nature of e-environment is highly conducive for participants immersion in the problem as well as the collection, connection and communication of information over an extended period of time. Developments in e-learning environment and the inherent design of e-systems fit naturally into the problem-based learning cycle and system.

CASES AND DISCUSSIONS

The full paper will illustrate case examples of how PBL and elearning has been used in various educational settings in universities in Singapore. It will elaborate on the challenges and benefits. E-PBL is not meant to replace the teacher and teacher should always possess the qualities that are irreplaceable by any system of learning. However it is important to recognise that educators today need to be able to design and make use of the e-learning environment as tools not only to vary the mode of learning but importantly to scaffold and enhance thinking and problem solving.

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