Utilizing Problem-Based Gaming Models For The Development Of Critical Thinking Skills In Thai Graduate Educational Programs*

Christopher Lee Johnson**

ABSTRACT

There exists a great need in Thailand today for young professionals who have the ability to critically evaluate current global threats and opportunities in order to provide an appropriate response. In order to do this they must have certain cognitive (thinking) skills, which they currently are lacking due to Thailand's educational paradigm. The learning model employed by the majority of educational institutions from primary to university is based on the "information transfer" model. If our goal is to create critical thinkers than we must provide a framework and skill sets, which can be taught through guided discovery sessions. Through the use of problem-based gaming (PBG) learners will be able to acquire the critical abilities as well as practice them in a contextualize manner that will insure their transfer to other learning tasks that requiring similar skills. In PBG, emphasis is placed on authentic learning tasks, experiential learning and collaboration. By allowing game players to generate hypothesis, PBG creatively test their outcome in the game world. This paper examines role-play gaming systems and their use in the development of problem-solving and critical thinking skills in Thai graduate educational programs.

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** Ph.D., Assistant Professor, Graduate School of Human Resource Development, National Institute of Development Administration (NIDA), 118 Serithai Road, Khlongchan, Bangkapi Bangkok 10240 THAILAND.

INTRODUCTION

There exists a great need in Thailand today for young professionals who have the ability to critically evaluate current global threats and opportunities in order to provide an appropriate response. In order to do this they must have certain cognitive (thinking) skills, which they currently are lacking due to Thailand's educational paradigm. The learning model employed by the majority of educational institutions from primary to university is based on the "information transfer" model (Komin 1990). The model centers on the concept that the teacher provides instruction through lectures or structured presentation from which the student learns or receives the data and then stores it in long-term memory for future retrieval and application to solve workplace situations. The flaw with this model is its reliance on de-contextualized learning. Unlike learning to fly a plane or practicing medicine or even driving a car which all require the student to "learn-by-doing" in the environment that it will be used, classroom-based lectures and presentations provide the learned information outside the environment. The problem arises when the learner tries to access the learn material at their workplace environment. Since the learning "cues" used to retrieve the information were created in the classroom the desired information is often not readily available as it would be if the cues were created in the environment that they would be employed. This effect is known as encoding specificity, which states "the organization of material and the context in which it is learned have considerable influence on how well the material is remembered" (Brunning, Schraw, et al. 2004). In fact Brunning goes on to point out that when the retrieval cues differed substantially from the cues that were present during the act of encoding (learning the material) an effective search and recall of memory may be impossible. We can then accept the effect of student performance of ill-defined problems tasks such as strategic planning; managerial tasks and other ill-structured activities can be greatly diminished to simple guessing the solution due to poor cues during subsequent memory retrieval search.

Developing Critical Thinking Skills

Diane Helpern (Halpern, 2003) provides a broad definition that highlights the main concepts of critical thinking. She defines critical thinking as: "…the use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed — the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions, when the thinker is using skills that are thoughtful and effective for the particular context and type of thinking task." Halpern (Halpern, 2003) goes on to create the following equation: Attitude + Knowledge + Thinking Skills = Intelligent Thinking. This "intelligent thinking" or critical thinking allows us to evaluate the outcomes of our thought processes. Additionally, critical thinking has been called "directed thinking" due to its focus on obtaining a desired outcome. Unlike non-critical thinking such thinking that happens when brush her teeth or while you eating your dinner, and is highly automatic and non-directed, critical thinking involves evaluating the thinking process or the reasoning that went into the concluding solution.

Problem-Based Gaming

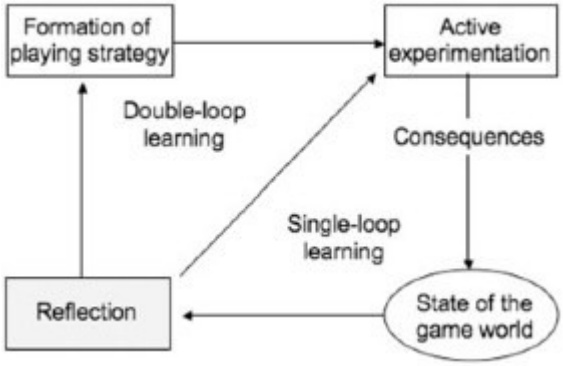
If our goal is to create critical thinkers than we must provide a framework and skill sets, which can be taught through guided discovery sessions. Ennis (cited in Brunning, 2004) describe twelve critical thinking abilities used during the process of critical thinking. Of the twelve, the following are key to creating a successful learning environment, which will facilitate the use of transfer of newly learned cognitive skills. These abilities include: focusing on the question, judging the credibility of the source, making value judgments, identifying assumptions, deciding on an action and interacting with others. Through the use of problem-based gaming (PBG) learners will be able to acquire the critical abilities as well as practice them in a contextualize manner that will insure their transfer to other learning tasks that requiring

similar skills. In PBG, emphasis is placed on authentic learning tasks, experiential learning and collaboration. By allowing game players to generate hypothesis, PBG creatively tests their outcome in the game world. Kiili (Kiili, 2005) suggests that the game environment itself is a large problem, which has smaller causally linked problems embedded in it. Using the work of J. D Bransford and the Jasper Woodbury Project (Vanderbilt, 1993) the basic idea of PBG is to anchor the learning of knowledge and skills into meaningful activities which use problem-solving and critical thinking in situations the learners are likely to encounter daily during on-the-job activities (Schank, 2002). This situated learning supports learning by contextual-dependent activities, which further supports the transfer of knowledge and skills into new novice areas through their use in practice during game play. The storyline and its accompanying game world, which is the background in which the gaming activities played out, help create an environment, which is highly motivating and engaging for the learner. Examples include: counter-terrorism, strategic organizational planning and even emergency service disaster scenarios. Additional benefits include the collaborative nature of problem solving activities embedded within the game world. Kiili outlines how the PBG model works:

> The PBG process usually starts with strategy formation. The player tries to form an appropriate playing strategy in order to solve the problems that the game provides to him. In the beginning of the game, the player forms a playing strategy based on his prior experience. If the prior knowledge about the subject domain in the game genre is inadequate for that, the player may start the gaming process by simply exploring the game world...after strategy formation, the player tests his strategy and possible hypothesis in the game world and observes the consequences of his actions. After the active experimentation phase occurs a processing phase - a reflection phase...reflection is a human activity in which people recapture their experience, think about it, mull it over and evaluate it. The feedback to the game provides from the player's actions should support reflective thinking and

knowledge construction by focusing a player's attention to relevant information from the learning point of view. The outcome of the reflection phase may be personal synthesis or appropriation of knowledge, validation of hypothesis laid during playing strategy formation or a new strategy to be tested. (Kiili, 2007)

The figure below graphically shows the PBG models doubled learning:



Problem-based gaming model describes the learning process with games (Kiili, 2007)

As illustrated by the model's diagram, reflection is vital to learning; it greatly affects who learns effectively from experience. While this reflection is not always a conscious process, however it is only after the player processes his/her experience can they make actively aware the decisions and consequences used during game play.

Role-Play Game Systems: Key To Putting It All Together

There exists a series of role-playing games that use a set of dice to allow gamers to immerse themselves into real-world problem-solving environments. Early versions of the game known mainly by its acronym D&D for Dungeons & Dragons focused on players gathering for quests to destroy evil and reap their fortunes in gold. While these medieval genre games still provide opportunities for thinking outside the box they are not the focus of this paper. Since D&D's inception over 30 years ago it has evolved allowing a new genre to come to the forefront. While an in-depth discussion of the types and styles of RPG that exist today are outside the scope of this paper their common link of providing an environment for the development of critical as well as problem-solving skills is central to this work. As previously mentioned these games use a set of die to randomly generate outcomes from the various encounters the players have. The 20 sided die or d20 is given special importance in the D20 Modern Gaming System. D20 for most part deals with adventures in current time, in fact the core rulebook likens it to playing in a Hollywood action movie. While D20 does not attempt to accurately reflect modern life, it does provide enough hooks so players will feel as though they are experiencing a real-life drama thereby adding an emotional component to the learning experience. The system has been used to play scenarios currently at the forefront of modern life such as antiterrorism, hostage standoff's, and even corporate espionage. Its ability to immerse players into real-world ill-defined experiences moves the D20 Modern Gaming System to the forefront of critical and problem-solving training events. While providing an environment that encourages risk-taking as well as allowing players to sharpen their cognitive skills through problem-solving and critical thinking exercises, safety is maintained if failure does take place.(Johnson 2005) This safe feeling combined with the emotional adrenaline rush of an action movie creates the perfect platform for experts to evaluate novice learners thinking through observations of their reactions to the presented challenges. Since the Game Master

(GM) controls the flow of the game they have the ability to interject unexplained events, to shake things up when players seem lax or over confident of their ability. Additionally the GM may wish to connect a series of events that to the player seems completely random until the trap is sprung and chaos breaks loose. This provides special interests for those who want their players to begin to develop observational skills required to quickly and effectively evaluate potentially dangerous situation.(Johnson 2007) While many may see D20's advantage for shoot-em up adventures such as those involved in antiterrorism training they may be skeptical about its other uses. By providing a properly crafted background story, gamers can be taken into the world of corporate finance where their mission is to engineer a hostile takeover of a competing company or engage in a restructuring of a Fortune 500 company. Such business scenarios could include side stories of office politics including: sexual harassment and even good old-fashioned ladder climbing and all that that entails. While this may not be as exciting as storming an apartment building to free hostages, if played correctly may produce high levels of emotional engagement. On its website (d20 2007) D20 offers a variety of free prewritten scenarios from which the GM may simply follow the provided instructions or through modification of certain aspects of the story create a new drama into which they're gamers may explore (Morris and Hancock 2004). Cost of the gaming system is negligible, as game play only requires a core rulebook, gaming dice and paper. Additional materials may include toy figures or chips to assist players visualizing the unfolding drama. All encounters and actions have tables provided in the core rulebook to allow the GM to effectively manage game play. D20 places a premium on game action in order to maintain excitement as well as engagement. There is however one drawback to using these types of gaming systems, that is the steep learning curve for both the GM and players. While confusing at first to the novice player a good Game Master can easily direct them through the proper methods of game play in a short period of time. The challenge is developing the Game Mastering skills, while not overwhelming, the core rules can seem daunting to a novice GM. It is for this reason the use of

a prewritten scenario is recommended for beginning Game Masters. This places most of the skill acquisition on using the random encounter tables and guiding players through the adventure. If the system is used as a regular part of organizational training both GM and players will quickly fall into game play without even the slightest thought of the game's rules. Since only scenarios change, focus is placed on the problems at hand. This is similar to driving a car; you don't need to re-learn how to turn the steering wheel every time you want to drive a new car.

CONCLUSIONS

When we wish to train our young professionals to think outside the box in order generate innovative solutions to complex problems you must provide them with an appropriate training environment. This unique combination of structured framework (d20 System) and creative problem-solving activities within the context of a role-play game is just such an environment. Given ill-defined problems coupled with the thrill of an action movie the d20 Modern role-play gaming system allows trainers, teachers and facilitators a flexible tool to engage learners while promoting those cognitive resources, which are all but forgotten in a traditional lecture setting. Brunning (2004) points out how critical the learning cues are to the recall of the stored information and how lack of the correct cues when learning takes place can effectively block recall when the learner is on the job and requires the material to solve a problem. By allowing the gamer-learner to use skills in a manner similar to those at work then proper learning cues will be created which will increase the chances of recall on the job. This mental learn-by-doing is just as effective as the real thing and allows for greater flexibility in the learning environment (Schank 2002). Caution needs to be taken however to ensure that the players and the Game Master (GM) are adequately prepared to engage in the learning activity. Though the game itself is not complicated to play, scenario development and use of the random encounter tables does present a challenge to non-experienced gamers. This shortcoming can be

over come by allowing novice GMs to used pre-designed game scenarios in the beginning while they focus their learning activity on the proper use of encounter tables and game facilitation. When the GM has a firm understanding of the gaming system they can begin to refine their scenario development skills as new organizational concerns come into focus. When new players join the group a skilled Game Master will easily guide them through the games fundamentals ensuring a stress free learning event. While many people point to the gaming systems unfamiliarity as a draw back for learner engagement, the corresponding excitement of playing a live action movie around the lunch table far out weights any feelings of hesitation. Today's global market economy provides challenges that just a few years ago would have been considered impossible to solve, yet day after day young creative professionals not only solve them but also turn them into opportunities for even greater market growth. The key to their success is the ability to use critical thinking in combination with a variety of problem-solving heuristics to quickly assess the extend of the situation then act on developing an effective solution to bring about the needed change. Finally this low-tech high-touch tool provides a cost effective learning environment that all SME and Fortune 500 companies can justify in their yearly training budgets. The future truly bellows to those individuals that can see opportunities and capitalize on the — we just need to make sure they have the skills and this paper has provided a system for attaining such skills.

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