

The Development of Constructivist Cooperative Game Learning Environment Model to Enhance Problem Solving for Veterinary Students

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Abstract: This paper presents the Development of Constructivist Cooperative Game Learning Environment Model to Enhance Problem Solving for Veterinary Students. The purposes of this research were: 1) to study and analyze principles, theories and related researches, 2) to synthesize the theoretical framework, 3) to survey instructional context, and 4) to synthesize the designing framework. The results revealed as followings. The theoretical framework consisted of 5 bases: (1) psychological base, (2) pedagogical base, (3) technological base (4) problem solving base, and contextual base. The designing framework consisted of 4 steps and 7 elements included: 1) to activate cognitive structure and promotes problem solving, 2) to support for adjusting cognitive equilibrium, 3) to promote the knowledge construction and problem solving, and 4) to support and enhance knowledge construction and problem solving. The 7 elements of game-based learning environment as follows: 1) problem base, 2) resource, 3) collaboration, 4) problem solving center 5) scaffolding and 6) Coaching.

Keywords: Cognitive process, problem solving, learning environment, game

1. Introduction

Education is important for learners. The learners should be given a higher-order thinking skills such as critical thinking, analytical thinking, problem solving, and information transfer which focus on the use of methods. Simulation, discovery, problem solving and collaboration. Learners were received the authentic experience, it can be congruent with the real life. Therefore, the instruction design must be changed in order to foster problem solving, information seeking skills and knowledge construction rather than passively receive the knowledge. Instructional design theory (ID Theory) was used in this design. Essential theories used as foundation were as follows: constructivist theories, problem solving, transfer knowledge theories and media attribute, game, symbol system of web-base technology. These support the knowledge construction and problem solving.

2. Literature Review

2.1 *Constructivism Learning Environment*

Constructivism is a learning theory that focuses on learners' self-knowledge creation (Piaget, 1980). Primary goal of the theory is to design for a learning environment to foster problem solving and conceptual development in ill-structured problem solving. The ill-structured problem solving is associated with constructivist and situated cognition approaches for better learning.

2.2 Problem Solving

Problem solving, as an activity, is more complex than the sum of its component parts. Without question, problem solving necessarily engages a variety of cognitive components, such as propositional information, concepts, rules, and principles (domain knowledge). However, it also involves structural knowledge (information networking, semantic mapping/conceptual networking, and mental models), applicative skills (constructing/applying arguments, analogizing, and inferencing), and metacognitive skills (goal setting, allocating cognitive resources, assessing prior knowledge, assessing progress/error checking) in the learner. Additionally, problem solving also engages motivation/attitudinal components (exerting effort, persisting on task, engaging intentionally) and certainly requires knowledge about self (articulating prior knowledge, articulating sociocultural knowledge, articulating personal strategies, and articulating cognitive prejudices/weaknesses) (Jonassen & Tessmer, 1996). Ill-structured problems are those on which opposing or contradictory evidence and opinions exist, for which there is not a single, correct solution that can be determined by employing a specific decision-making process (Kitchner, 1983). The description of the ill-structured problem solving process (Jonassen, 1997) follows: 1) learners articulate problem space and contextual constraints, 2) identify and clarify alternative opinions, positions, and perspectives of stakeholders, 3) generate possible problem solutions, 4) assess the viability of alternative solutions by constructing arguments and articulating personal beliefs, 5) monitor the problem space and solution options, 6) implement and monitor the solution, and 7) adapt the solution.

2.3 Game

Games for learning research should account for prior research on learning in general rather than reinventing the wheel. Situated, authentic problem solving is an effective way to ensure that games can support problem solving. For a game-based simulation, our instructional designers apply game design and modeling. The simulations enable learners to apply their knowledge and skills in a simulated environment.

3. Method

3.1 Research purposes

To synthesize the designing framework of constructivist cooperative game learning environment model to enhance problem solving for veterinary students (CCGLE model).

3.2 Research design

Model research design base on Richey and Klein (2007) consisted of 3 phases: model development, model validation, model use. This study uses only the model development phase. The research method is documentary research, that consisted of to examine and analyze the principle, theories and related researches, to study the context teaching and learning. to synthesize the theoretical framework and the designing framework of CCGLE model.

3.3 Target Group

The target groups of this study consisted of 3 experts to assess the designing framework of CCGLE model.

3.4 Research instruments

The instruments in this study consisted of 2 instruments as following: 1) The expert review record form for checking the quality of the designing framework. 2) The synthesis of the designing

framework record form for record the data for synthesis of the designing framework of CCGLE model

3.5 Data collecting and analysis

The procedure of gathering and analysis data were as follows: 1) Synthesis of theoretical framework of CCGLE model. The data were collected by using the recording form for synthesis of the theoretical framework. 2) Synthesis of designing framework of CCGLE model. The data were collected by using the recording form for synthesis of the designing framework. Summarization, interpretation and analytical description were used to analyze the data.

4. Research Results

4.1 Theoretical framework

The results show that the theoretical framework of learning environment comprised of four basic theories: (1) Psychological base, (2) Pedagogical base, (3) Problem solving base, (4) Technological base, and (5) Contextual base. Figure 1 shows the relationship between the underlined basic theories components of the theoretical framework for augmentation.

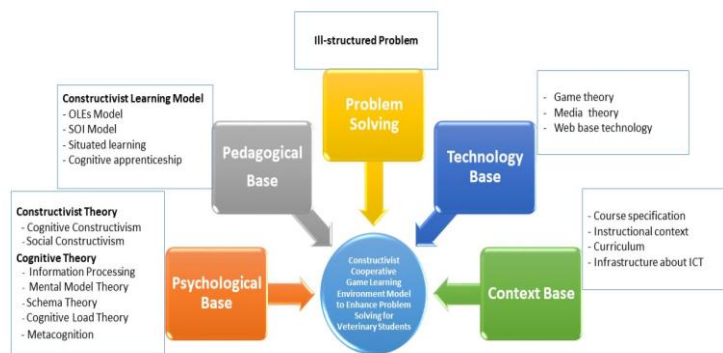
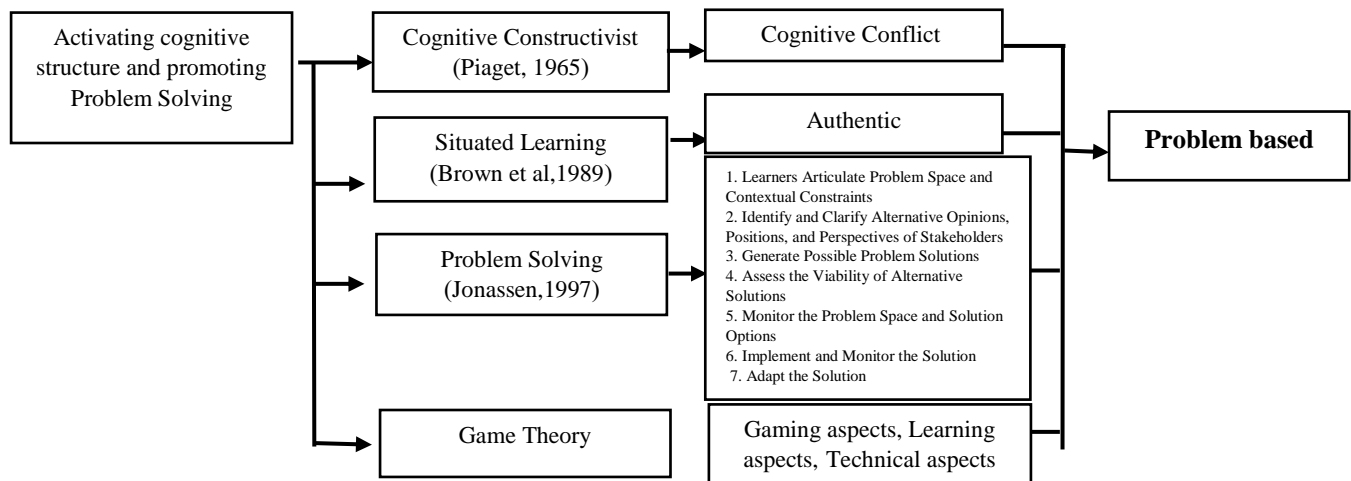


Figure 1. The theoretical framework of CCGLE model.

4.2 The Designing framework

The stage of the designing framework according to this study, the findings of synthesis of the designing framework of CCGLE model were showed 5 stages as follows: (1) activating cognitive structure and promoting problem solving, (2) supporting for adjusting of cognitive equilibrium, (3) promoting the knowledge construction and problem solving, and (4) supporting and enhance knowledge construction and problem solving. The designing framework in the design of the learning environment model illustrates in Figure 2.



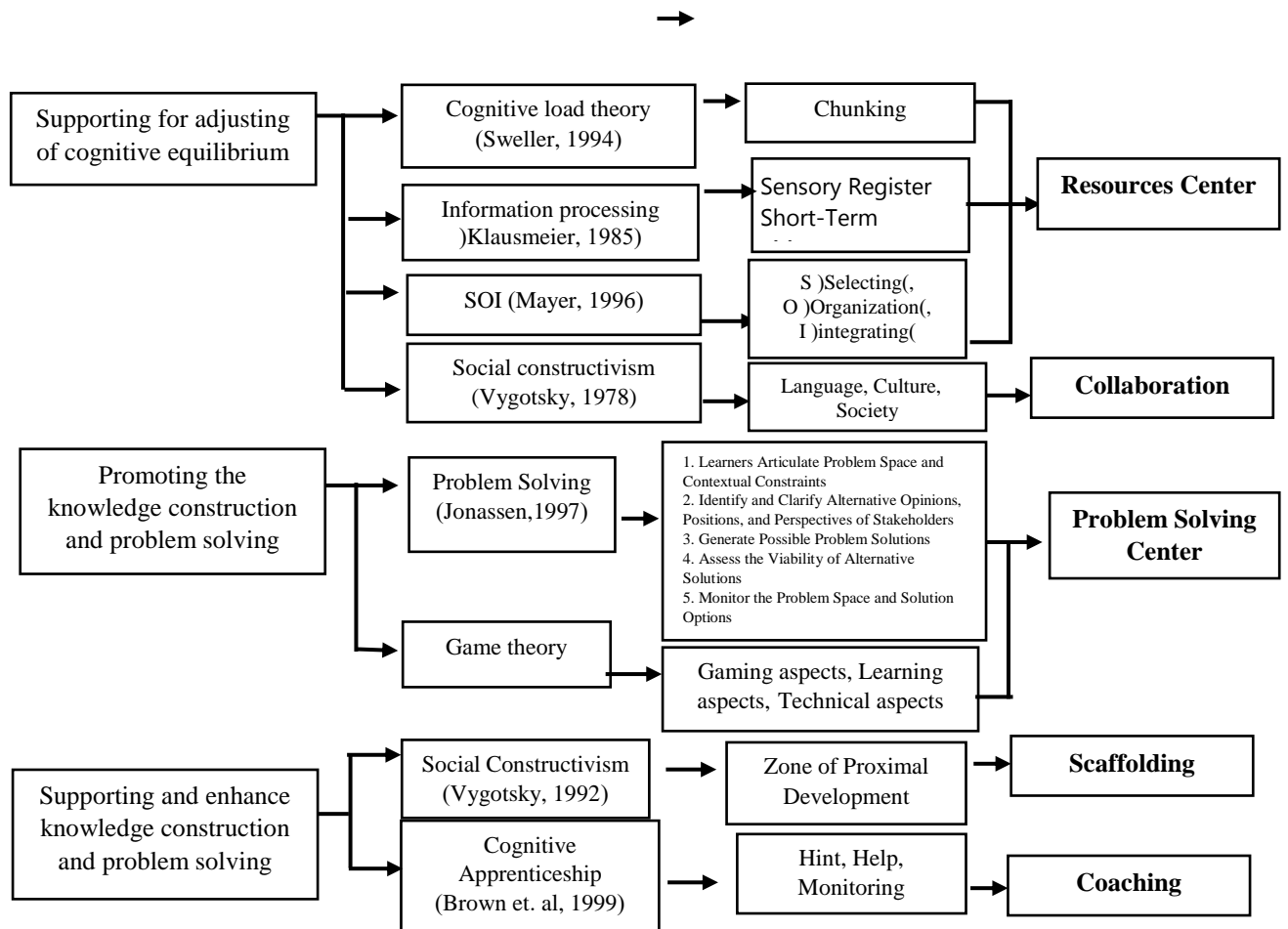


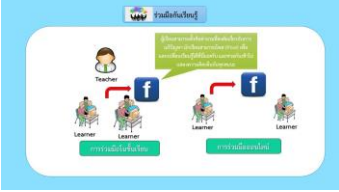



Figure 2. The designing framework of CCGLE model.

4.3 The 6 components of CCGLE model

CCGLE models designing framework comprised of 6 components as follows: (1) problem based, (2) resources center, (3) collaboration, (4) problem solving center, (5) scaffolding, and (6) coaching. An example of CCGLE model was showed in Table.

Table 1 The CCGLE model

Element	Describe the element	Example of Design Shot
(1) Problem based	Problem base was designed as a frame work to activate cognitive structure into disequilibrium by using enabling contexts	
(2) Resources Center	Resources was designed to support for adjusting cognitive disequilibrium by using essential principles and theories. The theories were applied to design the learning resources for providing information for the learners to construct the knowledge. This may help the learners processing information effectively and understand easily.	

Element	Describe the element	Example of Design Shot
(3) Collaboration	Social collaboration base was designed to support for enlarging cognitive structure and promoting Problem Solving . Social constructivism (Vygotsky, 1962) was used to design the Social Collaboration base. It may help support the learners for sharing experiences, multiple perspectives, adjust misconception, and collaboration problem solving.	
(4) Problem Solving Center	Problem situation in order to induce the learners into discovery learning process. And 7 abilities of ill-structure Problem Solving (Jonassen,1997)	
(5) Scaffolding	Scaffolding was designed to support and encourage knowledge construction of the learners. It may help the learners to guide and support learning efforts in their knowledge construction process.	
(6) Coaching	Coaching base was designed to support for providing hints and helps when needed, monitor learners, performance and help learners reflect on their performance. It may help the learners to conduct their performance effectively and prevent misconception of the learners.	

4.4 The CCGLE Model to Enhance Problem Solving for Veterinary Students



Figure 3. The CCGLE model.

Conclusion

Design of the CCGLE model, the procedures were as follows: (1) to study and analyze principles, theories and related researches, (2) to synthesize the theoretical framework, (3) to survey instructional context, and to synthesize the designing framework. The results revealed that (1) The theoretical framework consisted of 4 bases as following:)1(psychological base,)2(pedagogical base,)3(technology base,)4(problem solving base, and (5) context base. 2(The designing framework consisted of 4 steps and 7 elements included: 1(to activate Cognitive structure and promotes problem solving, 2(to support for adjusting cognitive equilibrium, 3(to promote the knowledge construction and problem solving, 4(to support and enhance knowledge construction and problem solving. And 7 elements of the CCGLE model as following: 1(Problem base 2(Resource 3(Collaboration 4(Problem Solving Center 5(Scaffolding and 6(Coaching This finding was consistent with Chaijareon, S., Samat, C., Kanjug, I.,)2012(; Techapornpong, O., Chaijareon,S.,) 2017(These previous research found that the students showed their problem solving and the framework of game-based learning environment models. As for this research finding may be the result of Instructional design Theory)ID Theory(. This was shown in the designing framework of the game-based learning environments model to enhance Problem Solving. The designing framework of the game-based learning environments model was recognized as the important one, because it can support and help the designers to design effectively and clearly. If this framework is lacking we can not design learning effectively. This study focuses on theoretical synthesis of theoretical framework. It is the first factor that is critical to the design and development of a learning environment based on a Constructivist learning environment. To Enhance the Problem Solving. The next effective, It also allows designers to perform clearly based on theoretical frameworks. As well as the use of research processes as a basis for design and development.

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