Enhancing Pupils' Concept of Leading Teamwork through Digital Game Approach

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Abstract: Developing the teamwork concept is necessary in the period of elementary education. The essence of teamwork not only involves the descriptive knowledge but also the skills, behavior and attitude. In the traditional education, knowledge is transferred from teachers, but not based on the real situation. In this study, we help pupils to learn a new abstractive concept through exquisite simulation game. Pupils can repeat trial and error and get immediate feedbacks from the game. We also explain how this game encourages the pupils to rethink and understand a complex concept.

Keywords: Leading Teamwork, game-based learning, Problem-Solving, Embodied Experience

1. Introduction

Traditional education has its success in emphasizing the descriptive knowledge. The style of traditional instruction is teacher centered. Teacher integrates the learning materials and instructs the knowledge through the methodical descriptions. It's oppositely weak in the complicated concept understanding and may reduce the opportunity of rethinking. Many studies indicate that the real situation is an indispensable part to learn the complicated concepts. People would find more information from the problem environments and may develop some skills which help them to solve the problem and get more knowledge.

Developing the teamwork concept is necessary in the period of elementary education. The essence of teamwork not only involves the descriptive knowledge but also the skills, behavior and attitude. In this study, we help pupils to learn a new abstractive concept through exquisite simulation game. Pupils can repeat trial and error and get immediate feedbacks from the game. We also explain how this game encourages the pupils to rethink and understand a complex concept.

2. Literature review

2.1 Situational Problem-Solving

The strategy of situational learning aims at helping the pupils to observe, participate, discover, or develop images as an expert in problem-solving. People understand best when they can simulate an experience in a way that the simulation prepares them for actions they need and want to achieve their goals [3]. Situational learning emphasizes on direct

observation on the scene and learning the actual skills of operation through exchanges and interactions. The learners must learn some skills in order to accomplish the designated tasks. Such views are similar to experiential learning. Experiential learning utilizes experiences in a unique context to facilitate knowledge acquisition and creation. The learner immersed in experiential learning is in contact directly with the learning subject [4]. During experiential learning, learners can establish their understandings and discoveries within their own previous real experiences to construct ideas and relationships actively in their minds [1].

2.2 Embodied Experience with Game-Based Learning

Game-based learning is about fun and engagement, and the coming together of serious learning and interactive entertainment into a emerging and exciting medium — Digital learning games [5]. Game is a series of challenges in a simulated environment. No body will tell you the rules in the games, they improve the skills of "rule discovery" through observation, trial and error, and hypothesis testing [5]. Video game is action-and-goal-directed [2]. People can act in the game and observe what result follow before they act in the real world [2]. They could enhance the effect of situational learning.

Game-based learning contains three main features: first of all, there is a clear objective for the learner to achieve; Secondly, there is a set of core skills that the learners must learn and repeat practicing; thirdly, there is a specific background situation. Video games entail a clear objective. It achieves the goal of attracting pupils to teaching materials and persistently emphasizes a concept or thinking. It attracts the attention of the pupils to some concepts or theories that the designers intended. This may be an abstractive concept that learners cannot easily realize, but this could help pupils to pay attention in order to abstract from situational and experience learning.

Background story is an important element for building up the situation context, and allows the learners to take positive action to engage in the learning environment. The background story is consisted of roles, scene, and a hidden framework of teaching materials. The background environment helps pupils to focus on the awareness in a learning context. Basing on these facts, we designed a simulation game to enhance the cognition of the pupils on the complex concept of leading teamwork.

3. Method

The objective of this experiment is an attempt to prove that pupils can reinforce the complex concept of leading teamwork through the elaborate design of simulation game in order to help them to build up an embodied experience and establish an imprint of the concept.

3.1 Teaching Materials

The content of the teaching materials is the way that a leader could effectively use his/her human resources. There are five concepts of attention, some substantial problems, and abstractive concepts.

Concept A: Identify the competence of each team member and assign the duties to the one who is best qualified for the duties: in this concept, pupils must know who is good in what and can do the best job.

Concept B: Sometimes, one task needs the cooperation of a number of team members for completion. Pay attention to the complementation of “strength and weakness”. The strength of each member should be fully demonstrated and cooperation and complementation is essential.
Concept C: Explicitly explain to the team members what you expect them to accomplish.
Concept D: Show your manner and assign the duties with courtesy.
Concept E: Monitor the progress of works whole-heartedly and observe the process through which the team members accomplish their assigned duties. Where necessary, encourage and help them.

3.2 The Design of Simulation Game

3.2.1 The Situation of the Game

We have designed a game situation as the exercise – an animal fair. In this game, each pupil must lead four small animals to run a booth at the fair. Each of the four animals has its character and competence. There are four missions for running the booth. The player must play the leader who determines the distribution of these missions. The goal of the game is to earn more money. A fair is not strange to the pupils because it is a very common event in elementary schools of Taiwan. Some pupils have actually participated in fairs. However, they have never been a leader of a booth. Here, we hope to extend the pupils’ original experience to learn the teamwork concept.

3.2.2 The Rules of the Game

In this game, the player can freely decide which animal does. For example, you can assign two sub-missions to one animal, or even all sub-missions to the same animal. The only one rule is that you can’t assign the same sub-mission to over two animals. In assigning the tasks, the player can check the attributes and competence of these animals. There is no time limit to think over the assignments.

3.2.3 Reflection of the Game

After the players decide their assignments, a 20-seconds short movie will display. The game starts to calculate the total earned money and the scores from each sub-mission. The movie is concerning the behaviors of the four animals during the fair. For example, if you assign nothing to one animal, you can see the animal just sleeping all the time. The players can observe the situation of each animal and the process of the increased money at the same time. Through trial and error, the player rethinks and reassigns a new plan for the mission (see Figure 1).

3.3 Participants

The participants in this experiment are pupils from two classes in grade 6 in an elementary school; 15 are in the experiment group, with 8 boys and 7 girls. Fourteen pupils of whom 7 are boys and 7 are girls participated in the controlled group. The game is used as the exercise in the experiment group and, the traditional test-and-review is used in the controlled group.

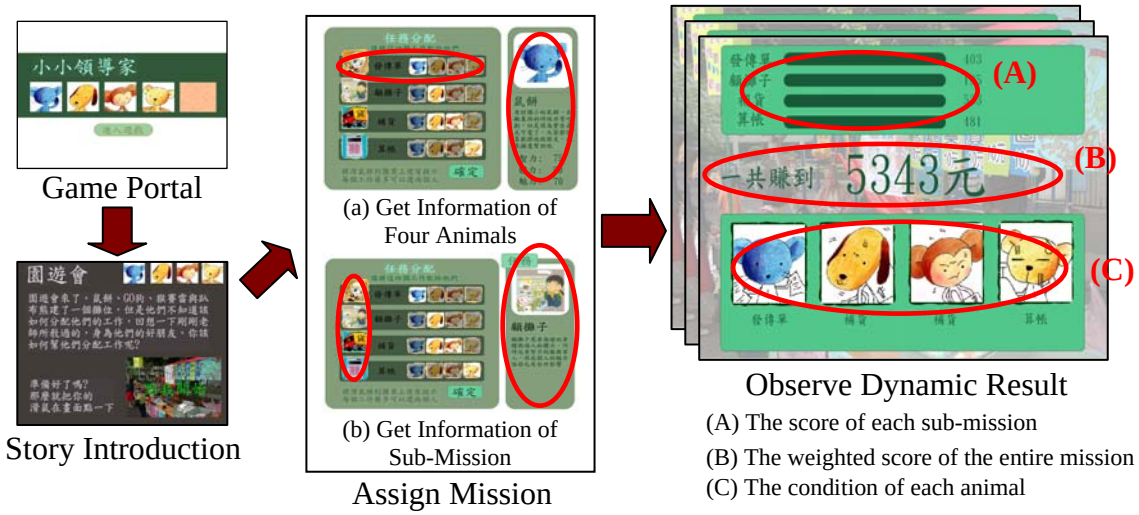

Figure 1. Game Procedure Circle

3.4 Procedure

The experiment includes four stages: lecture, exercise, test, questionnaire, and follow-up test. Firstly, the teachers give the same content for two groups and, give a brief lecture on the five major concepts, including examples. This process will last for about 20 minutes. At the exercise stage, the experiment group plays the simulation game. They must announce the earned money when they finish each round of the game. The teachers will note down the top three scores on the blackboard. The pupils in the controlled group will engage in a test of twenty multiple choices. After finishing the test, the teachers will review the content of the test. This process will last for about 20 minutes. At the test stage, all pupils are required to write down what they learned during the class, including the concepts or examples. After the test, they will respond to the questionnaire. Finally, after one week, the pupils will take a follow-up test. The follow-up test is identical with the previous test stage.

4. Results

We analyzed the data of the test and the Follow-up test to clear their understanding of the concepts. We applied two-way ANOVA to compare the variables of exercise type and time. The main effect of exercise type is significant ($F(1,27)=5.472$, $MSE=4.968$, $p<0.05$). The performance of the pupils in the experiment group is significantly better than the pupils in the controlled group (see Table 1). This means that the pupils in the experiment group tended to have more experience that helped them to translate the concepts into actions. In addition, the pupils could keep what they learned in mind for a longer time.

We also explored the motive of the pupils under different types of learning environments through the questionnaire. The results in question 1 and question 2 indicated that the pupils tended to prefer using simulation games in the exercise stage. They concentrate their attention on the game and activity. When the pupils were asked if the lecture from the teachers was helpful in the exercise (question 3), the pupils in both groups suggested that the lecture was helpful. There is no significant different between the two groups. When the pupils were asked weather the exercise was helpful to understand the concepts taught before (question 4), the experiment group shows more agreement than the controlled group. Although pupils realize the difficulty in the real situation, the pupils in the

experiment group feel more confident to apply what they learned in their daily life (question 5).

Table 1. The data of the experiment

t-test statistics related to the effects of learning achievement

Variables	Experiment Group		Controlled Group		T-value
	M	SD	M	SD	
Test	3.33	2.19	1.78	1.71	2.10*
Follow-up test	2.80	2.73	1.85	1.83	1.09*
N	15		14		

*$P < 0.05$.
M, mean; SD, standard deviation.

Q1: I prefer this type of class
Q2: I found the exercise very interesting
Q3: The content in the lecture presented by the teachers is very helpful in the exercise.
Q4: Through the exercise, I could understand the concepts taught by the teachers in the classroom much more clearly.
Q5: Exercises can help me to be more confident in applying the concepts I learned to real world situations.

Questionnaire results about the learning prompt of the two classes

Question	Experiment Group		Controlled Group		T-value
	M	SD	M	S D	
Question 1	4.15	0.68	2.25	1.05	5.29*
Question 2	4.23	0.72	2.33	1.15	4.87*
Question 3	4.15	0.98	3.58	1.37	1.19
Question 4	4.61	0.65	3.41	0.90	3.83*
Question 5	4.15	0.80	2.75	1.21	3.43*
Total	13		12		

*$P < 0.05$.
M, mean; SD, standard deviation.

5. Discussion

In this study, we allowed the pupils to understand complex concepts through participating in the exquisite simulation game. Through this real-time interactive simulation game, the player could get immediate feedbacks and repeated trial and error to stimulate them to rethink. This is an intermingling of teacher-centered learning and student-centered learning. At the first stage, teachers present the teaching materials and control the activities in the classroom environment. This part is teacher-centered learning. At the exercise stage, the pupils take control of classroom activities. The mission of the teachers changes to become an inspirer and encourage the pupils to get higher scores. This part is student-centered learning. We still lack a complete student model to help us in detailed analysis. In subsequent studies, we will explore how to create a student model in the game and observe more complex changes in order to support their learning.

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