Evaluation the situation somatosensory game digital learning for global warming misconception

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Abstract: This study designed an innovative learning material based on game-based learning theory and situational somatosensory game digital learning modules (Situational Somatosensory Game Digital Learning modules). It is a funny, interactive and educational tool in the sense of a combination of role-playing game with somatosensory. The main structure is built up by Role-Playing Game masters and Kinect Flexible Action and Articulated Skeleton Toolkit programs. The content of learning modules is developed by the relevant literature and cognitive conflict strategy, the scientific misconception of sea-level rise is designed to be solved during the gamed based self-learning processes. Through a pre-test/post-test questionnaire the descriptive statistics, ANOVA analysis of quantitative data and open questions are discussed. The results shows: 1. the learning (experimental group) effective use of scenarios and games, in addressing the global warming misconception have good study on the effectiveness of, and superior to the control group ($F = 6.31$, $p < .05$); 2.the learning module has over ninety percent of high satisfaction, and can effectively lead to motivation, and overall satisfaction than the control group. Based on the findings, the somatosensory game situational learning led to a strong and highly motivated satisfaction.
Keywords: Global warming, Somatosensory Technology, Role-Playing Game, Misconception

1. Introduction

Scientific knowledge of Global warming mitigation and adaptation is getting more and more important in present world, but through the domestic researches and survey, students and the general public still hold considerable misconception on global warming issues, taking action to provide correct knowledge and learning tools should be the first priority we need to go. To convert misconceptions in non-formal education is not easy, the first step is to inspire the motivation by interesting learning processes but not the unsuitable traditional learning. Therefore, this study tries to combine new technology based on the theoretical, the design and development of a new way of learning science to solve global warming misconception, and further validate its effectiveness and satisfaction.

According to the motivation of this study, research questions are listed below.

Q1: Try in a good theoretical basis and practical framework for the design and development of an innovative way of learning.

Q2: Explore the effectiveness of an innovative way of learning

Q3: Evaluation of the satisfaction of an innovative way of learning.

2. Literature review

Digital game is getting more and more popular recently through combining new technology, it could interest the users to learn by funny, highly interactive and instantaneity, it also can help the users to bring their mind up in how to knowing, using, solving and creating. Traditional pedagogy is not easy to learn because it's highly complexity in class, but digital game can help to solving the problem, learner can get knowledge or technology when they have fun (Trotter, 2004). Digital game is an E-media, it's inoculation for teenagers with casual, relaxed and diversity, thus the teenagers are more willing to learn new knowledge. As a Game-based learning materials, the first priority to develop is how to get achieve

a complete efficacy, such as problem solving, role-playing and Situation Simulation, that is to say how creativity and advisability blend into the content of courses and how to make a breakthrough in combining new technology. It's more interested the learner in RPG game genre than the others (Paraskeva, Mysirlaki, and Papagianni, 2010). Generally, the digital games need basic skills, it's not easy to the people that who has creative but unskilled to join the games industry (Blow, 2004).

Kinect

From Nintendo has been launched to the Wii, and the Kinect had been developed by Microsoft, they are the type of NUI. Kinect users can control the game directly by moving the body but needn't to hold the remote controller or wear device. It is easy to apply in many fields including the real life, education learning, entertainment, health care and other fields. Somatosensory interactive games can make learner involve into game situations easier and faster than traditional game with keyboard or mouse. The advantage of kinect game are with high interactivity, simple operation and less susceptible in age restrictions; however the weaknesses is that players need to standing continuously in the game. By study abroad, somatosensory technology have very good results in various fields, including the motivation, learning achievement and learning and memory. (Chao, Huang, Fang, & Chen,2012; Chun-Yen Chang, Yu-Ta Chien, Cheng-Yu Chiang, Ming-Chao Lin & Hsin-Chih Lai ,2013)。

Role-playing game

Role-playing is a game to be satisfied with role recognition , major interface is mainly with text have provided a environment with challenging and similar real-life situation . The most features of the protagonist have different characteristics, attributes or skills that players could accumulate experience points, level up and enhance the value of health points. Raybourn (2006) proposed role-playing game have the most helpful to solving complex problems and conflict mediation in learning. When learners actually play a role have experienced their point of view, the problems and solutions will become clear (Shifroni & Ginat, 1997), At the same time, role-playing is the most favorite game modes (Buchanan, 2004) applied to the assisted learning materials also have good learning effect.

Situated Learning

Situated learning placed the learner in real or simulated situations to learn through interaction between the learner and the situations, so that learner will apply what they have learned in actual life. When the scientific concept is abstract, complex and different with life experiences, it's process will be difficult to change the prior scientific concepts. Kathleen and Deborah (2004) considered the traditional digital learning is to provide knowledge and information, and less interaction with learner. Also Brown, Collins, & Duguid (1989) emphasize the learners construct knowledge by interactive with learning environment. Therefore, if the situational learning theory into the teaching content, it can development of situational learning, explores problems and solves problems. It will be more helpful for improves learning effectiveness. (Guralnick, 2008).

Global warming misconception

Global warming is part of the climate change. It becomes more wider and wider with its complexion than traditional science, the influence including scientific, political, economic and living. Moreover, it is cross-cutting, cross-generational and cross-border to make misconception of learning. Currently, people get many special messages from print media or electronic media in reporting global warming news, the news are not to be digested to accept. (Rye, Rubba, and Wiesenmayer, 1997). A lot of reason of the Scientific misconceptions are caused, Driver (1981) believe the misconception from the behavioral process in children and human interaction, as well as through their own observations and experiences obtained. And Gilbert, and Watts (1983) have proposed three perspectives: 1.children explore the world based on self-view; 2.child interested in doing something special for the scientific explanation does not consider whether the correct natural science; 3.They don't distinguish between different the scientific language and language of everyday life. Head (1986) also made five reasons: 1.daily experience; 2.analogy confusion; 3.fuzzy unknown confusion on the meaning of words; 4.learning with peer; 5.from individual nature of ideas.

3. Situational Somatosensory Game Digital Learning modules

Research framework

Situational somatosensory game digital learning modules which is applied by Game learning and situational learning theory and based on Piaget's theory of cognitive to solve the science misconception. Also it is Combining the role-playing game with kinect to effectively integrate in the learning method, learning tools and learning content (Figure. 1).

- Learning method: game-based, it integrated cognitive conflict strategy into digital material to make using characters as self-exploration and self-discovery. The learning method build cognition and break the original misconception for learners.
- Learning tool: somatosensory technology with role-playing games is used to develop better situational learning environment. Every movement in the game is meaningful to enhance the learner's interest in learning and impressions to reach entertaining.
- Learning content: features of the story to perform tasks and talking, with somatosensory control, learner can play easier and take into the situation for fun and challenge.

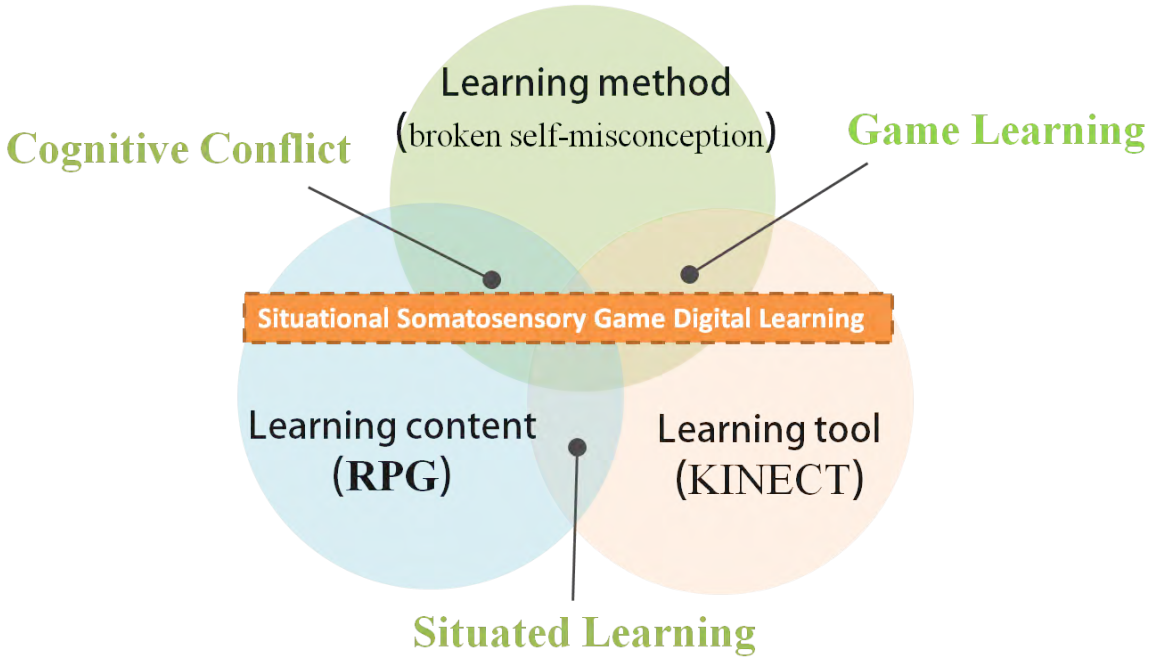

Fig. 1. research framework

4. Global Warming Misconception of material design

Learning strategies and processes

In this study the use of cognitive conflict is in three steps: (1) understand the learners' prior knowledge; (2) provide students with contradictory information; (3) assessment learners' cognitive change between pre-test and post-test. Figure 2 presents the strategies of learning design. First of all, make sure the learners' knowledge about the Antarctic and the Arctic ice melting to cause the sea-level rise of cognition before playing the game; second, play the game, through the game's story and dialogue, presenting a conflict with the results, learners can self-discovery and think for themselves; third, post-test to assess whether there are changes in cognition after the game, assessment points are misconception resolved and cognition established. Finally player will see a movie to consolidate this new concept, "seeing is believing" can help strengthen this perception.

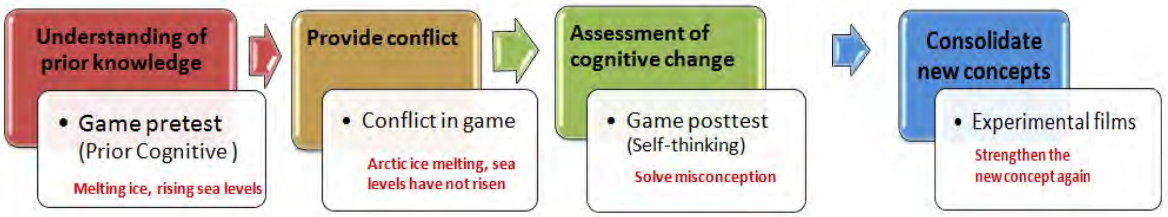

Figure 2. learning strategies

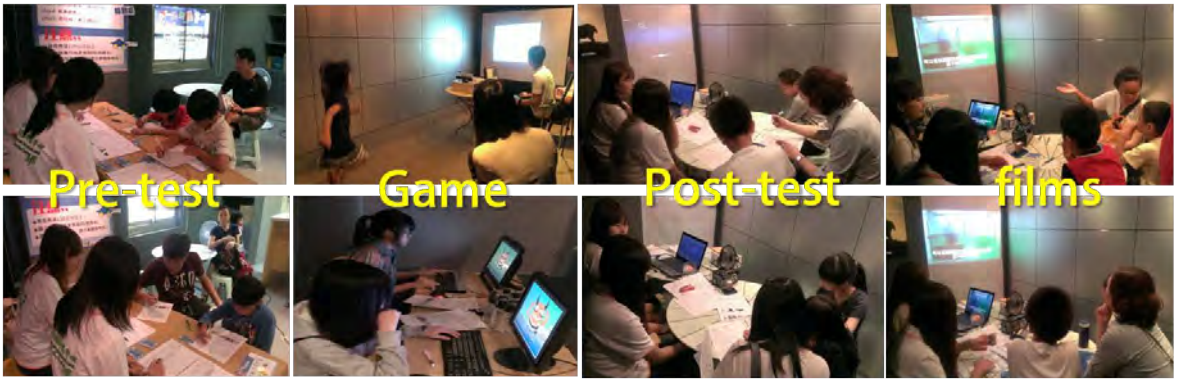

Figure 3. Research Process

Learning material design

The main objective is to establish a scientific knowledge and to solve misconceptions, this study focus on the case of the melting of the Arctic sea ice will cause sea levels rise. Design a self-learning process using the Antarctic, the Arctic ice melting caused by differences in sea-level change situation. There are five stages of the game content (Figure 4), the first step is to accept the task and play the role into the game situation, simultaneously, game will show learners the body operation to control the game; the second stage simulates the real and funny experience of marine environment of Antarctic and Arctic by real photos and virtual screen for learners; the third stage presents differences in structure of the Antarctic and Arctic by plot and dialogue, also guide the learners think about the influence of the land ice and ice land; by situations of life, the fourth stage by the game of saving polar bears and penguins, solving the misconception of "Arctic ice melt will cause sea levels to rise".

Figure 4. Game screens

5. Discussion

Quasi-experimental method is adopt to assessment of the performance, using of the somatosensory system is assigned as the experimental group and the control group is using a conventional keyboard device for learning, the total number of test facilities is 426 (165 in the experimental group and control group 261), through a pre-test/post-test questionnaire the descriptive statistics, ANOVA analysis of quantitative data and open questions are discussed.

According to quantitative data analysis shown that : 1 All of the testing scores shown significant improvement by using the game-based learning processes in solving the global warming misconception (experimental group mean improvement 1.15, control group mean improvement 0.92), also we found the outcome of somatosensory-combined design is better than traditional keyboard ($F = 6.31$, $p < .05$). These results indicate the innovative somatosensory game situational learning can effectively improve the global warming misconception as well as highly confidence in future adaption and promotion; 2. From the investigation, the testers' knowledge of global warming are coming from television media, teachers and the network, it is consistent with domestic research. But the cross analysis from pre/post test scores showed that the source of information got by learners with proper scientific understanding in their prior experiment is come from schools and teachers; 3. By the assessment results, the satisfaction for physical operation is up to 86.3% in experimental group learners, and for the game interesting, memory degrees, smoothness is higher than 90%. Moreover the willing to using the same learning module but different contents is totally agree (100%), that shows the design of this study, said somatosensory game situational learning, lead to a strong and highly motivated satisfaction.

6. Conclusion

This study has successfully developed a low cost Situational somatosensory game digital learning module, it is the first exploration in using somatosensory technology with role-playing games, to solve scientific misconception, than through formal teaching experimental results show that the concept for the global warming misconception resolved, and the establishment of proper scientific knowledge, a good upgrade results. Specific results are concluded below:

1. A successful use of low cost and easy to entry with RPG Maker and a free FAAST to develop the production of the game materials, cost of production has a good advantage in the subsequent promotion of environmental education.
2. Features of role-playing game including the dialogue, the plot and visual presentation to guide the effective thinking and learning in the teaching content. The results show the learners have high satisfaction in innovative learning method that can triggered strong motivation and interest, and to achieve learning objectives and effectiveness for happy learning.
3. Both of the experimental group and control group has good satisfaction higher than 90%, and experimental group were better than control group. Specifically, the willing to using the same learning module in different contents is totally agree (100%), that shows the Situational somatosensory game digital learning modules of this study, led to a strong motivation and highly satisfaction.
4. From this study of pre/post test showed that the source of information got by learners with proper scientific understanding in their prior experiment is come from schools and teachers, so it is recommended that correct conduction of scientific knowledge, and to accept the message of environment and situation are highly correlation between. But the message (learning content) is best through integration and design, in order to establish the correct perception.

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