An Investigation of 3D User Interface Metaphor to Assist the Teaching Method in Game-Based Learning Process

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Abstract - Nowadays, teachers more likely use board marker and a white board to communicate the teaching materials. In the digital version, people use software to explain the materials and projected into a screen in front of class. Therefore, the future of teaching and learning process in the education environment will be varies, from non-digital to fully digital.

In general, there are a lot of approaches able to be used to enhance the process. The methods and techniques used will be applicable mainly to construct students’ behavior in the learning process. The methods can be used as a means to assist student have better understanding of a subject taught by comparing and contrasting artifacts digitally.

In the non-modern era, subjects will be taught using demonstration tools. At some points, some equipment fails to operate due to lack of maintenance. Meanwhile, in the digital era, there are some issues in hardware and software to this matter because there is no specific software designed to supports students’ understanding in a practical-based subject. Moreover, the existence of 3D User interface can be considered to be utilized in the class activity, especially on a game-based learning process. This 3D User Interface metaphors will be designed based on the subjects needs due to subject’s characteristics and uniqueness. It may also depend on the subject’s specific difficulties that special assistant may be required by the students.

The goal of this paper is to analyze and evaluate how this method in using metaphors on 3D User Interface can be used as a means to support the game-based learning methodology.

Keywords - 3D user interface, artifacts, game-based learning, metaphors

I. INTRODUCTION

The goal of this paper is to analyze and evaluate how this method in using metaphors on 3D User Interface can be used as a means to support the game-based learning process in a classroom environment. This paper will also discuss about the current development of 3D user interface and its relation to enhance the game-based learning process.

II. PROBLEM IN INSTRUCTIONAL TEACHING AND LEARNING PROCESS

There are various types of learners in the education sectors. There are a lot of ways for learners to obtain knowledge from the teachers. One of the methods is called the instructional methodology. There are many ways to implement the instructional teaching method. One of them is by giving a set of instruction for them to finish.

The objective of giving instructional methods is to let them know what to do and give direction on what the learners are supposed to do. They will then build their own knowledge by doing the task and getting direction from the teachers. In this situation, learners will get both experiences in instructional and constructivist teaching method.
“What children learn depends not only on what they are taught but also how they are taught, their development level, and their interests and experiences.... These beliefs require that much closer attention be paid to the methods chosen for presenting material...” Saskatchewan Education, 1988. (p.10)

Sweller, 1994 mentioned about the limitation of concurrent working load in human brain during the learning process. Miller, A.G, 2001 stated that human working memory is generally considered to have limited capacity. People will be affected in the long term memory process to memorize certain things. It is acceptable to understand the limitation of human cognitive thinking.

Baddeley, 1992, stated that working memory is divided virtual-spatial scratch pad and a phonological loop to deal, especially with audience and information.

Each individual has different type of work load process. It is essential to understand the capacity of each individual audience.

Especially, the exploration of cognitive load is important to know what and how audiences interact with the teachers. It is important to engage with the presenter in terms on content and context delivery. The complexity of navigation can affect the audience and consequently lead to misleading information.

II. 3D USER INTERFACE

Nowadays, 3D User Interface outlook is not really common for some people to be implemented in the real world environment. But, along with that, the interactivity of 3D environment design will be able to influence the audience in terms of attractiveness.

Shneiderman, 1998 stated that there are the three pillars of successful user interface design, consist of guideline documents, user interface software tools and expert review and usability testing.

The development of 3D user interface keeps increasing. Therefore, the implementation of 3D User Interface in the game-based learning process is expected to be more interactive and having more attractiveness value in front of the audiences or viewers. It is also expected that teaching and learning process can be more comprehensive.

Bonnano specifically splits game design features refer to the degree of autonomy (user control) and interactivity (sharability). Those conditions are critical to build the experience of game-based learning process. There are two levels of experiments carried out during the observation. They are doing the process using real objects and doing the process using 3D User Interface mode.

A. Real time environment

Herrlich, et al, (2008) explained about the significant action in the process of doing rotation a cube. “When rotating the cube, it should snap into certain positions to ensure a dependable and easy interaction and the transition of one view to the next, i.e. of one face to the other, should be made clear by using an appropriate real-time interpolation scheme”. It shows that real-time view will be more relevant to increase students understanding.

By using such a scheme, the user will be able to follow how the old view changes to the new view without losing orientation. Learners are expected to be able to get the full instruction by following the direction.

B. Game characteristics

Bonnano explained the collaborative gaming condition, more specifically the type, frequency and directionality of interactions that occur in group-based gaming, affected three categories of independent variables identified during preliminary investigations and observations.

IV. METHODOLOGIES

A. Game Based Learning Methods

This section will be discussing about the methodology used for this specific observation, including the concept of game-based process in a specific subject.

B. Game-Play On Game-Based Learning Process In A Multimedia Physics Class
The essential parts of a game design are fun and enjoyment during the process. The use of game method in education environment can be helpful to assist students learning. Bonnano stated that technological model can be guided by the game-based model to enhance the learning process. This specific model can be used collaboratively with the former method in the teaching and learning process to both expert and novice learners.

As Bonnano also mentioned that there are some specific items to be analyzed during the investigation on the game-based method. The items are more likely dependent. There are also independent variables that can be analyzed during the observation under certain condition. They can be included as the (1) type, (2) frequency and (3) interaction direction. Type of game will be specified to game that carried out an experiment in a specific multimedia physics class.

C. Observation And Data Collection Methods

The methods focused on the interactivity between 3D User interface and the non 3D User Interface is mainly about previewing content to the audiences using game-based learning method to achieve better teaching and learning process in the education environment. It is important to explicitly view the navigational elements during presentation. In this user observation, ethnography research method will be carried out to obtain required data.

“Using ethnographic methods you must let go of your own presumptions and assumptions about a group of people in order to effectively learn anything about them”.

Byrne mentioned that anthropologists who performed ethnographic research often would live in the community being investigated. Therefore, data collection will be carried out by having the observer sitting around the participants to get the data, including asking questions, taking notes and giving questionnaires away afterwards.

Participants will be observed during the preview in the class. Viewers are expected to compare and contrast the methods used in the 3D User Interface and the real experiment for 10-20 minutes, in conjunction with the game-based learning process.

D. Data Sampling

Analysis data will be taken from IT students doing Multimedia Physics in semester 2 and some other professionals.

First analysis was carried out among IT students in the university level enrolling in physics subject. The reason why students were chosen to be the target group is just because of the appropriateness of the methods and the possibilities of action taken in the university environment in the particular subject. Physics subject contains

Some students, in fact, have difficulties to get into certain subjects. There were a lot of factors that influenced the experiments.

The second target audiences were chosen from professionals as common audiences in certain education level. It is expected to acquire different set of information from these selected audiences. Second target audience can be categorized as more experienced participants than the first one. It is expected to have broader data about the 3D User Interface in the game-based learning process.

The analysis will be driven by digital 3D User Interface technology to play around with the navigation and content which will affect the material delivery from presenters to audiences or viewers. The observation will be carried out after the presentation.

The observation will include an analysis of interface design complexity, the connection between viewpoints and interface, the realistic value between the design and 3D model, cognitive load, error prevention in terms of the understanding of content and 3D User Interface consistency in the game-based learning process.

After each experiment and presentation, audiences will be given a few questions to get the data of the viewing preferences, including the understanding of the context of the materials.
V. RESULTS

The table below shows the population of 36 students (A), categorized as novice users and 30 professional (B) will then be categorized as experienced users.

A. Content and Navigation attractiveness

The significant importance of 3D Navigational elements was observed by comparing and contrasting two different views. Result shown that 3D user interface has more impression than 2D. In fact, the real experiments shown that the understanding level was at the highest when students are able to play around with the model explained in the 3D mode.

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VI. CONCLUSION

This is to conclude that:

- Navigational elements in 3D User Interface has more impact on students understanding level doing experiment in multimedia physics subject

- The method of embracing diverse model in interaction design using game-based learning process embedded in 3D User Interface will increase the understanding level for students of teaching materials.

- Some students had difficulties in getting around 3D Interface due to inexperience situation

- Both background and foreground in the both environments did not affect the understanding to the process. The game method is more attractive due to the differences.

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REFERENCES


