

Chapter 12

Teaching Complex Theoretical Subjects Using Digital Game-Based Learning in the Faculty of Creative Industries, UTAR

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Abstract Base on the constructivist theory of education, digital game-based learning (DGBL) can be applied to most subjects and skill level as it has the ability to connect educational content via computer technology and games. This review explores the differences between an established delivery method- (lectures and tutorials) and interactive delivery method- (collaborative learning and game-based study material) that conveys theoretical content for tertiary level subject. Results from this research will determine the learning outcome of individual students. The study investigates the effectiveness of a collaborative learning environment where students contribute to the game-based study tool design content which aids in their study of complex and theoretical content. This provides them a platform to collaborate and use familiar devices such as the Internet, discussion group and game-based study tools. A pre-test paper and questionnaire of the content area will assist in determining the outcome of the students' performance scores from each group (traditional vs collaborative).

Keywords Digital game-based learning • Teaching • Theoretical subjects

12.1 Introduction

The learning process should be interesting, easy and fun. Despite having an association with children, fun and informal education; game- based learning is a new educational approach for universities to encourage lifelong learning.

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How does game-based learning fit into all of this? Games today mainly comprise the virtual environment- filled with realistic graphics, engaging characters and dynamic storyline where players can control. Klopfer et al. (2009), quotes that the promise of games is that we can harness the spirit of play to build new cognitive structures and ideas of substance. Game-based learning generally refers to the use of video games to support teaching and learning. The intention of game-based learning is to discover an academic and ICT (information and communications technology) approach to learning whilst providing learners a platform to acquire skills and competencies in the working world. Through game-based learning, learners are exposed to challenges and are required to solve tasks virtually.

Though pedagogy and game design appears to be two separate worlds, an emerging number of literatures emphasize the importance of establishing instructional strategies and theories to design educational games and facilitate game-based learning. Based on the perception above, together with the inherent learning environment, state-of-the-art facilities and infrastructure, this research attempts to investigate the usage of digital game-based learning as an instrument in teaching complex theoretical subjects in tertiary education. The investigation is tested on a subject offered by the Faculty of Creative Industries in Universiti Tunku Abdul Rahman.

The aim of this research is to develop a new teaching material that uses ICT to teach complex theoretical subject in the Faculty of Creative Industries, UTAR.

The research has three main objectives: (1) investigate the use of collaborative learning environment that has students contribute to the game-based study tool designed content, (2) examine the effectiveness of game-based study tool via complex theoretical content and students' final assessment, and (3) provide a guideline for educators and game designers in developing a game-based teaching material for future classes.

The research hypothesis will discover if students in the Faculty of Creative Industries, UTAR learns theoretical subject better and faster when game-based learning method is applied in comparison to conventional lecturing method.

12.2 Conceptual Framework

The proposed game-based learning framework can be used to map out the design of new/existing games and act as an evaluation tool too. If a current game design lack features found in the framework, it can aid in finding those features and improvise accordingly. Game designers will determine the game design starting with the learning column, followed by the instruction column and finishing with an assessment. The learning column needs to define the learning objective, player's goal and the learning content. In the instruction column, attention is paid to the learning cycle, consisting of the user behaviour, feedback, engagement and learning. The instructional design is a platform where user's action provides sufficient feedback and triggers engagement that leads to learning. The assessment column gathers three

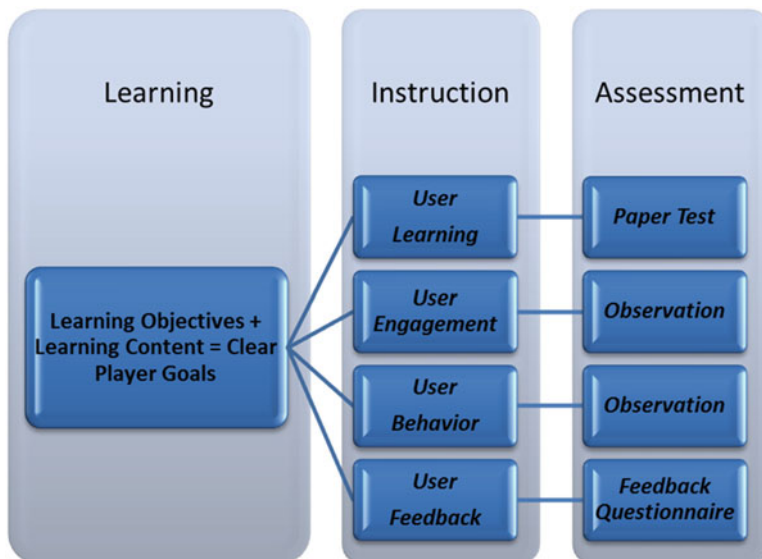


Fig. 12.1 Game-based learning framework

variants; testing, observation and feedback. It leads to learning outcomes where game players are surrounded by a specific educational context (Fig. 12.1).

12.3 Method

This research adopts a mixed method research design where the collection and analysis of data uses qualitative and quantitative methods in a single study (Creswell and Clark 2001). Survey interviews with open-ended questionnaires were conducted during five lectures within the Faculty of Creative Industries, UTAR. The purpose of the survey is to discover challenges encountered while teaching complex theoretical subjects, particularly on a specific subject or course where most students may have difficulty in understanding. Naturalistic researchers believe that gaining knowledge from sources that have ‘intimate familiarity (Lofland 1976) with an issue is far better than the “objective” distancing approach that supposedly characterizes quantitative approaches (Marlow 1993). Qualitative approach was conducted to collect data that identify problems and, gather opinions about the research. Interview with respondents are recorded, and the results will influence the design of the prototype.

The course that was selected was the- UJMD2143- Animation a compulsory course for Graphic Design and Multimedia students offered in Year 2 and 3. Four topics were selected from that course based on the results of the initial interviews. Once the game based-learning material prototype was designed, it was test on 120 students who took the course.

Students were divided into 2 groups. Group A were taught via the conventional lecture method while Group B was taught using the game – based learning material. After the four sessions, students from both groups were given the same test but for Group B, they were provided with close-ended questionnaire after the test. These questionnaires were distributed to garner feedback from students who have participated in the game-based learning method.

The research instruments used to interview lecturers are open-ended questionnaire. Open-ended questions allow the respondent to express his/her answer in detail, but are more challenging to analyse. For the prototype survey questionnaire, close-ended questions were used. Close-ended questions have a definite set of answers where respondent selects. One of the choices is ‘Other’ as it gives respondents the option to write down their personal response. Close-ended questions are easier to standardize and can provide statistical analysis (Fink 1995).

12.4 Findings

Below is the feedback from five lecturers who had experience in teaching the subject:

Lecturer 1: “Most students tend to fall asleep after 15 min of my lecture class if the topic that I had to cover that day is too complex and theoretical.”

Lecturer 2: “Those students who are taking this subject are graphic & multimedia students, therefore without any interesting visuals, sound and interactivity; they would get bored easily.”

Lecturer 3: “My students prefer my lecture slides to be full of pictures, videos and animation. If there is an application that I can use to make my lectures more interesting and interactive, I would definitely need one.”

Lecturer 4: “Nowadays, students are engaged with technology in every second of their daily life. Game-based learning might be the answer for future teaching and learning.”

Lecturer 5: “I would probably be interested and adopt game-based learning (GBL) into my lecture but the only thing that concerns me is if there is any easier way for lecturers to add and update their own teaching content into GBL as how we are doing with our power point presentation?”

The lecturers’ feedbacks were used to develop the four intended topics that are considered as the students’ least favourite subject. Also, the developed GBL must be made available on all platforms, mainly via computers and are accessible for lecturers to add in their own content when necessary.

Below are the bar charts showing the results of the test paper between Group ‘A’ who attended the conventional lecturing class and Group ‘B’ who attended the game-based learning class. Total number of students for each group is 60. Based on the chart, 5 students from Group A achieved an ‘A’ score while Group B shows a higher number of 16 students. There are also an increasing number of students

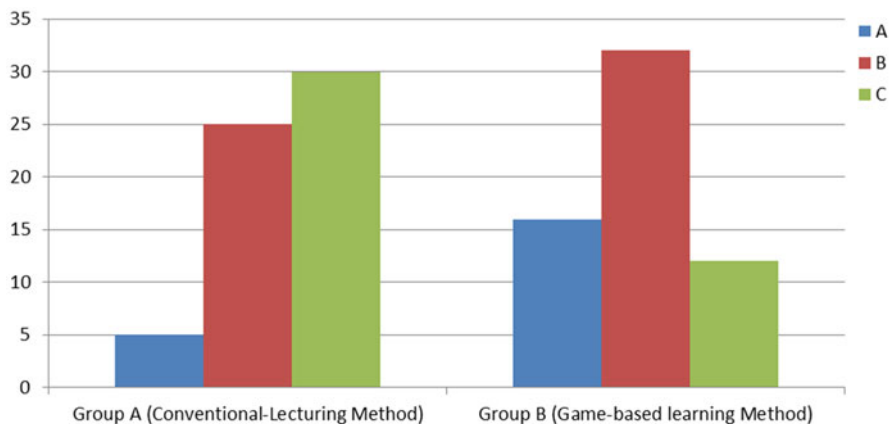


Chart 12.1 Bar chart shows the paper test result between Group A and Group B

achieving a 'B' score with 25 from Group A and 32 from Group B. Meanwhile, the number of 'C' score from Group A is 30 and Group B is 12 (Refer Chart 12.1).

Group B were given a close-ended questionnaire to garner their feedback about their experience with game-based learning method (Peterson 2000).

12.5 Results and Discussion

The data analysis from the questionnaires and interviews contributed substantially to the findings of this research. Based on the objectives of the research, data gathered were analysed and reported as below:

Objective 1: Investigate the use of collaborative learning environment that has students contribute to the game-based study tool designed content.

Results from the study shows that 82 % of the participants (students) felt that the experienced garnered from the game-based learning method are more interesting than the conventional teaching method (Refer Chart 12.2).

96 % of the survey result demonstrates the students' preference towards game-based learning method to learn theoretical subjects (Refer Chart 12.3), and 60 % of the participants agree that playing game-based learning materials catches their attention and make them understand the content better (Refer Chart 12.4).

Objective 2: Examine the effectiveness of game-based study tools via the complex theoretical content and the students' final assessment

Comparing the results of their mid-term (Group A-conventional lecturing method and Group B-game-based learning method), results of game-based learning for 'A' and 'B' score increased by 18 % and 11 % respectively while 'C' score decreased by 30 % (Refer Chart 12.1).

After tried the game-based teaching materials, how do you feel on overall of the experience?

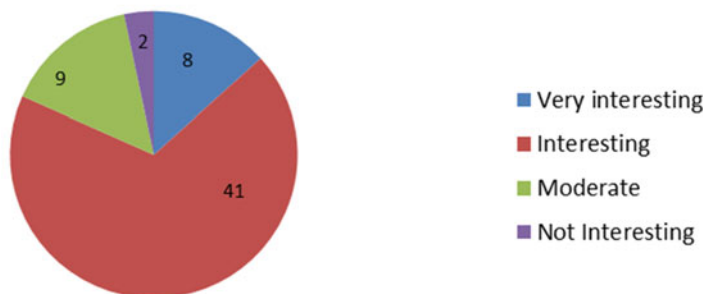


Chart 12.2 Pie chart shows feedback from students who experienced game-based learning method

If you are to choose in learning your theoretical subjects, which method of teaching would you prefer to be implied in these subjects?

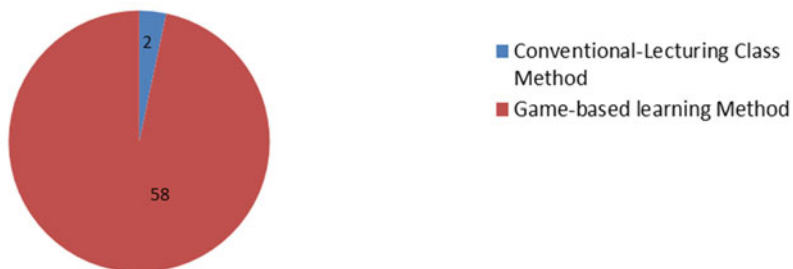


Chart 12.3 Pie chart shows the student preference after trying out game-based learning method

After tried the game-based teaching materials, how much do you understand those topics given?

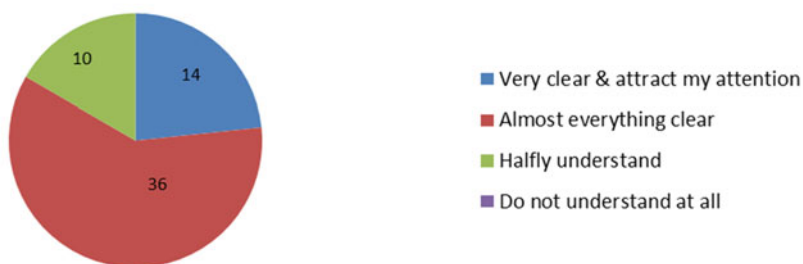


Chart 12.4 Pie chart shows students feedback on their understanding of content

If the game-based teaching materials to be improve in the future, what aspect should the improvement be focus on?



Chart 12.5 Pie chart shows students feedback on how to improve the content of game-based learning

Objective 3: Provide a guideline for educators and game designers in developing game-based teaching materials

Results from the user feedback (close-ended questionnaire), shows the need and interest of the user to participate in this research. 40 % of the users (students) would like an improvement in the design, 30 % of the users selected content, while 25 % of the users highlighted the difficulty level of the subject. Only 5 % requested for the user interface to be improved (Refer Chart 12.5).

12.6 Conclusion

In order to successfully implement the game-based learning method for complex theoretical subjects, further research and development is imperative, particularly in the area of content, necessity and technology (Refer Chart 12.5). Based on the information gathered and with proper technology training, lecturers are capable of designing their own game-based learning material.

“The key to a good educational design, whether in regular courses or in serious games, is to achieve alignment and balance between the learning, instruction, and assessment aspects” (Bisso and Luckner 1996). This means that despite having set the instructions for the prototype based on the learning objective, the assessment needs to show if the participant (students) has effectively learned the subject. Based on the prototype testing and survey, most of the respondents had a positive experience and were keen to learn more from this method.

This research proved that digital game-based learning provide motivation for learning subjects that are very complex or theoretical to teach due to the nature of the subject that is dull or complicated. The method provides user a fun and interactive experience, which engage users with the subject matter. Once learners are motivated, a number of elements have been discovered that accelerates the effectiveness of

learning including questioning, problem solving, and multiple senses feedback and reinforcement, challenge, involvement and relevance of “doing,” through simulation and cognitive apprenticeship.

The role of the learner is critical in bridging the gap between the game designs and learning tools. While new research studies have demonstrated the efficiency of accelerating and providing personalised learning via serious games in comparison to traditional learning method, there is a significant amount of proper installation framework and learning-driven game design strategy required. The approach has the potential of revolutionising the game content and education industry.

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