“Chem Twist” for Secondary/Tertiary level Education

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ABSTRACT

This study describes the effectiveness of “Chem Twist” in teaching and learning Chemistry at the secondary and tertiary level. “Chem Twist” is a multimedia game which enhances student’s engagement and their understanding on writing chemical formula. The objectives of this study are (i) to determine the relationship between student’s engagement and the designed multimedia game. (ii) to determine students understanding on writing chemical formula. Visual basic network was used to design “Chem Twist”. “Chem twist” was designed to help students to adapt to all learning levels and help keep the classroom learning interactive and exciting. A Likert scale questionnaire is used to determine the relationship between student’s engagement and the designed multimedia game. Besides that, a set quiz questions is used to determine students understanding on the particular topic. The results will be discussed in the paper. The findings of this study provide further evidence in support of the significant effects of multimedia games on Chemistry students.

1 Introduction

The advance technology of computer is becoming very prominent in education industry over the last decade. It is also well established world wide as universities, schools, government bodies and private organizations are funding many projects [1]. Computer plays an important role in every student’s life. The vital role of computer among most of the student is not learning but playing games. Generally students show positive attitude towards games. Games provide deep impact in teaching and learning environment [2]. Therefore, there is a need for computer aided games learning materials in teaching and learning activities [1]. Many researches have been conducted to investigate the application of multimedia games in the teaching industry. Multimedia game in classroom is one of the latest and exciting ways to understand a particular subject. The learning outcome will be identified before the multimedia game is designed [3]. This provides a platform for constructing active learning to enable students to get hands-on experience. Hand-on games engages students actively to the subject matter. The students achieve their goal as they complete the game [4]. Undoubtedly, learning through games does not solve every problem in classroom but it is an effective tool to engage students in active learning [5].

Chemistry by nature defines as a difficult subject [6]. It has been always taught in a traditional way where it focused on teacher’s centred activities [6]. Recently, there are more emphasis given to the variation and creativity in classroom teaching and learning. Most of the educators are using various multimedia applications such as power point, animation and video clips effectively in their classroom teaching. This technology is slowly replacing the traditional teaching. Many researchers investigated the effectiveness of student centred activities in Chemistry education. There are vast improvements in teaching techniques and the usage of teaching aids in teaching industry. Student’s engagement with the teaching aids is one of the most important factors which may affect teaching and also student motivation to learn. Students perform better when teachers use more attractive and creative teaching tools [7]. Computer games can be utilized to motivate students to engage in learning and understand the content better. Chemistry education incorporate with multimedia games will also provide a positive attribute towards each student but it is still in the preliminary stage. This is because the educational game industry is not fully developed in many countries including Malaysia. However, there are many research have been conducted to identify the strength and the weakness of the game

and allowing for suggestions for future redesigning. The purpose of this research study was to determine the student's engagement with the designed multimedia game and also to measure their understanding writing chemical formula.

2 Method

The "Chem Twist" is developed to enhance students understanding on writing chemical formula. It is also used to determine the relationship between student engagement and the designed multimedia game. Pre University and higher secondary school took part in this survey. The game was developed using Visual basic network. It has been incorporated with word scrambles and concept matches. It consists of five levels and the user has to click start button to begin the game. A few elements appear and the user has to click the correct formula in order for the correct name of the compound to pop out. The user has to answer correctly to move on to the next level. Once the game is completed, the time will be locked. The duration of the game depends on a student's current competency with the chemical formula. Chemical formulas are written according to certain rules. According to Irene Cheng etc, students are able to operate and learn the complicated rules without referring to any complex manual in short period of time. Therefore "Chem" Twist was introduced to secondary and tertiary students [2].

2.1 Participants

The participants consisted of 68 male and 59 female students from private college (Sunway College) in Malaysia. The students were aged between 18 to 23 years old (M=18.45, SD= 1.15). There were also 18 male and 10 female students from private school (Sunway International School) took part in the survey. This group of students were aged between 15 to 19 years old (M=16.89, SD=1.56).

2.2 Procedure

A brief explanation of the game procedure was given to the participants. They were given almost forty min to complete the game. Participants were given approximately ten minutes to complete the questionnaire which consisted of two sections. Section One comprised information about the subject's age and gender and Section Two comprised five questions. Ratings are done on standard five-points Likert scales. The anchor points are the same on all scales, ranging from 1(strong agreed) to 5 (strongly disagreed). Besides that, students always were given approximately ten minutes to complete a short quiz questions which consisted ten multiple choice questions. The results were recorded. The responses to the survey were compared using Likert scale and SPSS software was used to analyse data.

3 Results and discussion

3.1 Student's engagement

User		Interesting	Interactive	Looking forward for more games	Useful for my knowledge	Waste of time
First timer	Mean	1.4426	1.6148	1.5574	1.5328	4.2787
	N	122	122	122	122	122
	Std. Deviation	.60370	.73233	.80339	.68254	.89315
Not first timer	Mean	1.6000	1.6000	1.4000	1.6000	4.0000
	N	5	5	5	5	5
	Std. Deviation	.54772	.54772	.54772	.54772	.70711

Figure 1: Mean and standard deviation of first timer and not first timer for each question (tertiary level education students)

Figure 1 shows the mean and the standard deviation of tertiary level student's responses for each question. The majority of the students played an educational game for the first time. In fact both groups strongly felt that the "Chem" Twist is an interesting, interactive learning game and it is useful for their knowledge. They are also looking forward for more games in classroom. Besides that, all the students disagreed with the statement; "Chem" Twist is a waste of time.

User		Interesting	Interactive	Looking forward for more games	Useful for my knowledge	Waste of time
First timer	Mean	1.0000	1.0000	1.0000	1.0000	3.9643
	N	28	28	28	28	28
	Std. Deviation	.00000	.00000	.00000	.00000	.18898

Figure 2: Mean and standard deviation of first timer each question (secondary level education students)

Figure 2 shows the mean and standard deviation of secondary level student's responses for each question. All the secondary school students in this survey are exposed to the learning game for the first time. All of them are strongly agree that "Chem" Twist is an interesting and interactive game. They also strongly feel that it useful for their knowledge and looking forward for more games. All the participants are disagreed that "Chem" Twist is a waste of time.

Time		Interesting	Interactive	Looking forward for more games	Useful for my knowledge	Waste of time
Less than 5 min	Mean	1.5000	1.5000	1.5000	1.5000	5.0000
	N	2	2	2	2	2
	Std. Deviation	.70711	.70711	.70711	.70711	.00000
Less than 10 min	Mean	1.5556	1.3333	1.3333	1.5556	4.2222
	N	9	9	9	9	9
	Std. Deviation	.72648	.70711	.50000	.72648	.83333
Less than 15 min	Mean	1.5333	1.9333	1.6000	1.7333	4.3333
	N	15	15	15	15	15
	Std. Deviation	.51640	.59362	.63246	.59362	.61721
Less than 20 min	Mean	1.4257	1.5941	1.5644	1.5050	4.2475
	N	101	101	101	101	101
	Std. Deviation	.60575	.73727	.84162	.68737	.93173

Figure 3: Mean and standard deviation of time taken by tertiary level students for each question

Figure 3 shows the amount of time taken by tertiary level students to complete the game. Majority of the students took less than 20 min to complete the game. This is because most of the students are not exposed to educational games in classroom when they were in secondary school. Generally the mean for the first questions was midway between "strongly agree" and "agree" regardless of the duration taken to complete the task.

Time		Interesting	interactive	Looking forward for more games	Useful for my knowledge	Waste of time
More than 20 min	Mean	1.5920	2.6521	1.9094	3.0120	4.2025
	N	28	28	28	28	28
	Std. Deviation	.46291	.47550	.84162	.33333	.40825

Figure 4: Mean and standard deviation of time taken by secondary level students for each question

3.2 Student's achievement

The quiz score for tertiary level students are lies from 9 to 10 (M=9.88, SD=0.3311). It shows majority of the student's scores full marks. On the other hand, secondary school students scores are from 8 to 10 (M=9.110, SD= 0.7821). Basically, active teaching and learning does take place. The outcome skewed to the full score.

4 Conclusion

The result of this survey indicates that students responded positively towards "Chem" Twist that replaced traditional learning method. "Chem" Twist is an effective as a learning tool which increased student's engagement and understanding on writing chemical formula. However, future studies are needed to fully explore the impact of learning games in classroom

References

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