JPPS (Jurnal Penelitian Pendidikan Sains)
p-ISSN: 2089-1776
e-ISSN: 2549-1597
Volume 8, No. 2, Mei 2019
https://journal.unesa.ac.id/index.php/jpps/index

EDUTAINMENT WITH COMPUTER GAME as A CHEMISTRY LEARNING MEDIA

A Lutfi*, Suyono, Erman, R Hidayah
Faculty of Mathematics and Natural Science,
Universitas Negeri Surabaya,
Surabaya, Indonesia
*e-mail: achmadlutfi@unesa.ac.id

Abstract. The research aims to get answers to whether chemistry learning with computer-based games as learning media can create fun learning (edutainment). The study was conducted on students in three high schools in chemistry learning according to plan, during the learning activities were observed by students, before and after learning the learning outcomes tests and student questionnaires were conducted. The results showed that learning activities were 90.4% to 92.0% as expected, 90% to 100% of students stated that learning was fun with games as learning media, and learning outcomes had achieved 93% to 100% classical completeness. These results indicate that the use of computer-propelled games as chemical learning media can create chemical learning that pleases students and can be used by teachers as an alternative to edutainment chemistry learning.

Keywords: ***edutainment, game, chemistry learning***

INTRODUCTION

Edutainment is a fun learning process, one of which is by using the game so that students easily grasp the essence of the learning without feeling they are learning. Learning does not have to be a tedious or even painful process for students. Learning success is highly dependent on the strategies and methods used, one of the alternatives used is edutainment. With edutainment students undergo the learning process but will not feel they are learning (Hamid, 2014).

Meanwhile in the field of psychology, Csikszntmihalyi (1998) presented a flow theory and showed the positive role of the game in learning. Flow theory describes a condition in which humans are involved in an activity carried out with full concentration. In addition Caillois (2001) also argues that play is the center of human existence or existence.

Permendikbud No. 22 of 2016 states that the learning process in educational units including chemical learning is held interactively, inspirational, fun, challenging, motivating students to play an active role, and providing sufficient space for initiatives, creativity, and independence in accordance with their talents, interests, and physical development and student psychology (BSNP, 2016). Badan Standar Nasional Pendidikan (BSNP), as contained in the Century-XXI National Education Paradigm, states that the National Education Paradigm is democratic, nuanced, open-minded, challenging, exercising a sense of responsibility, will stimulate students to come to school because they are happy, not by force.

Learning chemistry in 3 (three) senior high schools obtained data that 40-50% of students stated that chemistry learning was unpleasant, meaning that it needed improvement during chemistry learning. Students who wish to learn that there is innovation means that students want to learn more fun. 70% -75% of students want learning media in the form of games that are expected to help the learning process that is fun and helps understand chemistry.

Active learning is all forms of learning that allow students to play an active role in the learning process itself, both in an interactive form between students and between students and teachers. Active learning is also one of the most effective ways to be able to provide a very effective learning atmosphere that provides an interactive, interesting and fun learning atmosphere so that students are able to absorb new knowledge and knowledge, and use it for their own benefit and their environment.

Learning media is something that can be used to convey subject matter, the media can provide incentives for students to occur in the learning process. The better the learning media, the better and maximum the ability of students to receive and digest the material in learning (Hamid, 2014). A good learning media must attract the attention of students, can develop student interest, according to the characteristics of students, according to student learning styles, and in accordance with the objectives to be achieved (Lutfi, 2017).

Every learning requires careful planning in choosing learning media so that effective learning is obtained. One medium that can be used is a computer-based game that allows in visual and verbal forms, each of which is related to episodic and semantic memory, according to the theory the Code predicts that information can be remembered better than and has a contribution in improving the quality of learning. The presence of the game as a learning medium has a challenging and fun advantage that eventually students can learn easily and feel happy in following the learning (Indriana, 2011). Through the game students can show their ability to overcome problems and master the knowledge and skills learned (Pribadi, 2011). The game can provide a diverse learning experience and can be in a variety of classroom atmosphere from all classes to individual activities. Games can also be an effective way to get students' attention to learn certain topics or skills (Smaldino et al., 2012). This means that chemical learning should please students so they can achieve learning goals.

For this reason, efforts are needed so that edutainment which includes students learning feels playing, students feel learning is easier, and students want to continue learning, then research is done by using computer-propelled games as a chemical learning media to create enjoyable learning without leaving learning objectives planned.

METHOD

The study was conducted in 3 (three) schools in chemical learning by using computer games as learning media according to planned activities. The games used are different in the three research locations and the game meets the eligibility criteria, the class and school determination is done in a random way. During learning, observations were carried out on student activities, before and after learning the learning outcomes test was carried out, and students questionnaire was given to get responses to the use of the game as a learning medium. The subject matter and location of the study are presented in Table 1.

Table 1. Research Subjects and Location

No.	Subject	Class	School/group
1	Chemical Element	XI	SMA N Ponorogo (A)
2	Acid Base	XI	SMA N Sidoarjo (B)
3	Hydrocarbon	XI	SMA N Sidoarjo (C)

Data obtained during the study included: (a) student learning activities, (b) student responses to chemistry learning by using games as learning media, and (c) student learning outcomes test scores.

Student activity data obtained were calculated as percentage of each aspect of student activity in each group. Questionnaire for student responses consists of categories of positive and negative questions, in a positive statement getting a score of 1 if answered "yes" and a negative statement will get a score of 1 if answering "no", the score of the response is expressed in each statement. Learning outcomes tests are arranged according to the learning objectives and student learning outcomes calculated in the classical completeness level in each group, and tested the difference in the average score between the initial test and the final test. Questionnaires are arranged to determine students' responses to the use of computer games as Chemistry learning media, questionnaire results are calculated percentage in each aspect of student responses and calculation results are discussed qualitative description.

RESULT AND DISCUSSION

Student activities during learning using games as learning media are obtained as follows.

Table 2. Students Activities

No	Student Activities	Student activities		
		Group A (%)	Group B (%)	Group C (%)
1	Students complete the task according to the time provided.	20.3	22.5	23.5
2	Students use various strategies for gathering information from the game used.	21.2	20.3	19.4
3	Students convey ideas clearly.	15.0	14.8	12.4
4	Students try to ask questions and answer questions that arise in class.	11.6	10.3	11.0
5	Students try to keep trying to follow the flow of the game.	22.3	24.1	25.2
6	Students divert attention from teaching and learning activities or irrelevant activities	9.6	8.0	8.5

The results above show active students while learning to use the game as a learning medium, it seems that students want to continue to follow the flow of the game and try to find information from the game during the learning process. It is also seen that only a small proportion of activities are outside learning activities, namely 8.0% to 9.6%.

Student responses

The results of student responses after learning chemistry using games as learning media are presented in Table 3 below.

No.	Statement	Score		
		Group. A/32	Group. B/30	Group. C/31
1*	I felt that learning Chemistry was too long.	31 (97%)	30 (100%)	31 (100%)
2*	I feel learning Chemistry with this boring game.	30 (94%)	30 (100%)	29 (93%)
3	After learning Chemistry with the game, I became more happy with Chemistry.	29 (91%)	29 (97%)	30 (97%)
4	I want to study Chemistry again with the game.	30 (94%)	29 (97%)	29 (97%)
5	I feel that learning Chemistry by playing earlier has become easier.	30 (94%)	27 (90%)	29 (97%)
6	If possible, I want to take the game home to study at home.	31 (97%)	30 (100%)	30 (97%)
7	I want to tell friends or parents about learning Chemistry.	32 (100%)	28 (93%)	29 (97%)

No.	Statement	Score		
		Group. A/32	Group. B/30	Group. C/31
8*	I want to study chemistry with the game immediately stopped.	30 (94%)	30 (100%)	29 (97%)

*Negative Statement

The results of the questionnaire above show students do not feel the time used is over, not boring, prefer to learn, want to play while learning again, and want to share the learning experience with the game to the closest person, and want to continue learning chemistry and playing.

Student Learning Outcomes

Student learning outcomes after taking chemistry learning using games as learning media are presented in Table 4 below.

Table 4. Students Learning Outcomes

No	Group	Number of students	Initial test completeness (%)	Final test completeness (%)
1	A	32	6.25	93,75
2	B	30	6.67	93,33
3	C	31	6,45	96.78

The results above show that the final test had achieved the classical completeness of the three groups even though at the beginning the initial test learning had not yet reached completion. To test the difference in the average score of the initial and final tests is done with paired samples t test, for this reason, the normality of each group was tested using the Kolmogorov-Smirnov test assisted by the SPSS program. The following results were obtained.

Table 5. Results of Kolmogorov-Smirnov Test

	Class A Score		Class B Score		Class C Score	
	Initial	Final	Initial	Final	Initial	Final
Significance value	0.150	0.120	0.093	0.128	0.283	0.055

Based on the results in Table 5, it shows that the significance value is greater than 0.05, meaning that all groups are normally distributed, so that they meet the requirements for paired t tests on the scores of each class (Trihendradi, 2007). With the help of the SPSS program, the price of t is calculated to test the null hypothesis (Ho), which is stated as the average initial test score and the final score, the results of the calculation t are presented in Table 6.

Table 6. Results of Paired Samples t Test

	Class A		Class B		Class C	
	Initial	Final	Initial	Final	Initial	Final
Average	29.21	83.50	29.66	83.83	28.55	84.68
t value	14.37		13.72		17.22	

The results of the paired t test above indicate that the value of t in the area of rejection of the null hypothesis (Ho) means Ha is accepted, meaning that there is a significant difference between the average initial test score and the final test in class A, B, and C. This result means chemistry learning using computer games showed a significant increase in scores in all three classes.

The data obtained above shows that during chemistry learning using games as learning media makes students happy or makes the learning atmosphere happy. Happy here means the rise of student involvement in play and learning. Student activity is dominated by the expected activities in the learning plan, these results are in accordance with the opinion of Suger & Suger (2002) which states the game as a learning medium can involve students to interact with the material being studied. The observations of student activities show conformity with the results of the questionnaire, students want to continue playing even though the available time has run out, meaning students want to continue to complete the mission in the game.

Students' interest during learning shows that the game used as a learning medium can attract students to understand the concept of chemical material, this result is in accordance with the opinion of Poulsen (2011). The results of the questionnaire can show students 'desire to continue to study chemistry, games can increase motivation and increase students' enthusiasm in learning so that the learning process becomes more enjoyable (Virvou et al., 2005; Lutfi, 2013). Other results based on the questionnaire show students are eager and eager to play and learn again both at school and at home, this shows students eager to learn and motivate learning when students are familiar with playing (Agarwal & Saha, 2011).

The results of the questionnaire showed conformity with the results of observations of student activities, namely students felt happy to learn chemistry with games and students tried to continue to follow the flow of the game, and during learning students were enthusiastic and interested in playing, these results were consistent with the results of Aprianto & Lutfi (2018), what is stated as a learning media game creates fun learning for students and teachers.

Achieving the completeness of learning outcomes above is in accordance with previous research which

states the game has advantages over other media, because the game makes learning more interesting, not monotonous, and exciting (Freitas, 2010). Another opinion on the game as a learning media was revealed by Beck & Wade (Ridoi, 2018) who stated that the game can create a good training environment to solve problems in a collaborative manner. Students who learn with games can show better visual, psychomotor, and affective abilities (Aguilera & Mendiz, 2003). The use of computer-assisted learning media has been able to help students overcome the difficulties of learning chemistry at the submicroscopic level and this is a result of the development of representations of submicroscopic levels through visual media (Farida, 2012). The results of other studies also found that the use of computer-propelled games as learning media has been able to achieve thorough learning of chemistry on the topic of the nomenclature of inorganic compounds (Lutfi & Hidayah, 2018). Student learning outcomes are still there that have not reached completeness, this can be possible because not all students can master the subject matter in the same time period, this is in accordance with Majid's opinion (2016) that students who are smarter will master the subject matter in a shorter period compared to students who are less intelligent.

This learning result also shows the suitability of student activities and the results of student questionnaires that during chemistry learning using computer-based games learning activities are dominated by students, students are interested and always follow the gameplay so that student learning outcomes have reached classical completeness.

CONCLUSION

These results indicate that the use of computer games as chemical learning media can create chemical learning that pleases students, can create student-centered learning, can achieve mastery learning, and can motivate students to study chemistry.

REFERENCES

Agarwal, M., & Saha, S. (2011). Learning chemistry through puzzle based game: atoms to molecule. *9th IEEE International conference on emerging eLearning technologies and applications, 27-28 Oct 2011* (pp. 189-193). The High Tatras, Slovakia: Stars' Lesna.

Aguilera, M. D., & Mendiz, A. (2003). Video games and education: Education in the face of a "parallel school". t, I (1). *ACM Computer in Entertaimen*, p. 10.

Aprianto & Lutfi, A. (2018). Development Of The Adventure Of Element Based On Role Playing Game As A Learning Media On Element Chemistry Matter. *Seminar Nasional Kimia - National Seminar on Chemistry (SNK 2018)* (pp. 172 - 176). Surabaya: Atlantis Press, Advances in Engineering Research, volume 171.

BSNP. (2016). *Peraturan menteri pendidikan dan kebudayaan nomor 20 tahun 2016 tentang standar kompetensi lulusan untuk satuan pendidikan dasar dan menengah.* Jakarta: Kemdikbud.

Caillois, R. (2001). *Man, Play, and Games.* Urbana and Chicago: University of Illios Press.

Csikszentmihalyi, M. (1998). *Finding Flow; The Psychology of Engagement with Everyday Life.* Tanpa Kota: Bacic Books.

Farida, I. (2012). *Interkoneksi Multipel Level Representasi Mahasiswa Calon Guru pada Kesetimbangan dalam Larutan melalui Pembelajaran Berbasis WEB (Ringkasan Disertasi).* Bandung: UPI.

Freitas, D. (2010). *A Game-based Learning Framework: Linking Game Design and Learning Outcomes.* (online). http://sgi.cueltd.net/publications/papers/Chapter_Staalduinen_Freitas_-_Final.pdf.: Diakses 10 Desember 2013.

Hamid, M. S. (2014). *Metode Edutainment.* Jogyakarta: DIVA Press.

Indriana, D. (2011). *Ragam Alat Bantu Media Pengajaran Mengenal, merancang, dan mempraktikannya.* Yogyakarta: DIVA Press.

Lutfi, A. (2013). Memotivasi siswa belajar sains dengan menerapkan media pembelajaran komik bilingual. *Jurnal Pendidikan dan Pembelajaran, Terakreditasi Ditjen Dikti, 20(2),* Universitas Negeri Malang: 152-159.

Lutfi, A & Hidayah, R. 2018. Activating Student to Learn Chemistry using Chemmy Card 6-1 Game as an Instructional Medium in IUPAC Nomenclature of Inorganic. *The 2nd International Joint Conference on Science and Technology (IJCST)* (pp. 1-6). IOP Conf. Series: Journal of Physics: Conf. Series 953 (2018) 012198.

Lutfi, A. (2017). *Dokumen Mutu untuk Pengembangan Permainan Bersarana Komputer sebagai Media Pembelajaran Ilmu Pengetahuan Alam (Ringkasan Disertasi). ISBN 9786021083826.* Surabaya: Pascasarjana Unesa.

Majid, A. (2016). *Strategi Pembelajaran*. Bandung: PT Remaja.

Poulsen, M. (2011). *The GAME IT Handbook.* Oslo: Norway.

Pribadi, B. A. (2011). *Model ASSURE untuk mendesain Pembelajaran Sukses.* Jakarta: Dian Rakyat.

Ridoi, M. (2018). *Cara mudah membuat game edukasi dengan construct 2.* Maskha.

Smaldino, D L Lowther, J. D. Russell. (2012). *Intructional Technology & Media for Learning:*

Virvou, M., Katsionis, G., & Manos, K.. (2005). Combining software games with education: evaluation of its educational effectiveness. *Educational Technology & Society. 8(2),* (pp. 54-65).

Teknologi Pembelajaran dan Media untuk Beajar. Edisi kesembilan. Terjemahan Arif Rahmann. Jakarta: Kencana.

Trihendradi, C. (2007). *Langkah Mudah Menguasai Analisis Statistik Menggunakan SPPS 15*. Yogyakarta: Penerbit ANDI

Suger, S & Suger, KK. (2002). *Primary Games: Experiential Learning Activities For Teaching Children K-8.* San Fransisco: John Wiley & Sons, Inc.