

Use of Computerized Games on Chemistry Learning

Achmad Lutfi

Department of chemistry
Universitas Negeri Surabaya
Surabaya, Indonesia
achmadlutfi@unesa.ac.id

Rusly Hidayah

Department of chemistry
Universitas Negeri Surabaya
Surabaya, Indonesia
ruslyhidayah@unesa.ac.id

Ika Arum Hidayah

Department of chemistry
Universitas Negeri Surabaya
Surabaya, Indonesia

Abstract— This study aimed to determine the impact of the use of computer-friendly games on Chemical Adventure as a medium to study Chemistry on learning outcomes, learning interests, and student responses. The form of research used was Pre-Experimental Research with a single group design Pretest-Posttest One Group Design. The target of this research is the tenth grade students of high school in Sidoarjo. The data obtained was processed by qualitative descriptive analysis and learning outcomes were analyzed by paired t test. The results showed that the use of Chemical Adventure computer-based games on chemical learning can improve learning outcomes and classical learning completeness, interest in learning chemistry is very high and students give a positive response to the use of computer-based games as learning media. So the game can be used as an alternative learning media that improves learning outcomes, increases interest, and is fun. We must continue to develop computerized games as chemical learning media so that chemical learning is more fun for students to learn.

Keywords—game, chemistry, interest, learning media

I. INTRODUCTION

Chemistry is one of the compulsory subjects in high school. Chemistry lessons are considered difficult by students on understanding chemical concepts [1]. The difficulty of students in understanding the chemistry concepts is caused by the teaching material which is not to relate the three levels of chemical representation namely macroscopic, symbolic, and microscopic [2].

Chemical bonding is one of the chemical materials taught in class X. Chemical bonding material is a broad subject, so that on this subject a serious understanding is needed [3]. Based on the results of the pre-research questionnaire of students who have studied Chemical Bonds in high school Sidoarjo, East Java Indonesia have a low understanding of the Chemistry Bond material. Students have not been able to apply the concept of chemical bonds and tend to rely on memorization. Learners admit that in the learning process, they only hear and record explanations from the teacher where the blackboard or power point is used as the medium.

This is supported by the results of observations of chemistry learning activities, especially in the Chemistry Bond material in class X. When learning activities take place, students tend to be passive, reluctant to pay attention to the teacher's explanation, and even choose to play games. Monotonous learning makes students indifferent. Facts in the field show that when teachers present chemical bonding problems, more than 50% of students choose to see their friends' answers. Some even choose not to work on the questions given and instead do other tasks that are not given by the teacher. Learners seem bored and tend not to be interested in the learning process .

Interest in learning is one of the internal factors of students that affect the level of mastery of a subject [4]. If the learning interest of students is high, students will feel interested and happy about the subject matter provided by the teacher, especially in this case the Chemical Bonding material [5]. The low interest in learning will also have an impact on the low learning outcomes of students [4], include: (a) love/pleasure in learning, (b) Interest to the learning process, and (c) participation in learning activities.

Teachers as educators are expected to be able to overcome the problem of low learning interest of students. One way is to use learning media. Learning media is one of the external factors that plays an important role in determining the success of a learning process [4]. Media is everything that can be used to channel messages from the sender to the recipient so that it can stimulate the thoughts, feelings, and interests and attention of students so that the learning process occurs [6].

The game is one of the learning media included in the audio visual media [7]. Games that contain educational content are called educational games [8]. Games if used appropriately and wisely can eliminate stress in the learning environment, increase student learning activities, and stimulate enthusiasm in learning activities [9]. In addition, exciting learning activities using games can prevent boredom, leave a long impression in the memory of students, and create a more pleasant atmosphere during the teaching and learning process without leaving the learning

objectives [10]. This means that the game has great potential in building students' learning interest.

Currently available Chemistry Adventure game that is suitable for use as a learning medium on the Chemistry Bond material. The feasibility of the game in terms of aspects of validity, practicality, and effectiveness. The Chemistry Adventure game is adapted from the Super Mario Run game with modifications to the challenges, objectives, and rules of the game. The game is made on a PC or personal computer platform and contains problem solving activities that are equipped with Chemical Bonding material.

Based on the description above, This study aimed to determine the impact of the use of computer-friendly games on Chemical Adventure as a medium to study Chemistry on learning outcomes, learning interests, and student responses.

II. METHOD

The research method used in this research is experimental research. The form of research used was Pre-Experimental Research with the design of a single group One Group Pretest- Posttest Design. The population in this study were grade X students in High School Sidoarjo, East Java Indonesia. The sample used was 33 students in class X-7.

Students are given a pretest to find out students' initial understanding of the Chemical Bonding material. Then students are given treatment that is learning to use the Chemistry Adventure game as a learning medium. During the learning activities observation of the activities of students. After using the learning media, each student is given a posttest sheet. Posttest contains questions that are used to determine the completeness of student learning as the influence of the game as a learning medium. To find out the completeness of an individual formula is used:

$$\text{Individual Completeness} = \frac{\text{score obtained}}{\text{maximum score}} \times 100$$

For classical completeness can be calculated using the formula:

$$\text{Classical completeness} = \frac{\text{complete students}}{\text{number of students}} \times 100\%$$

Individual learning completeness is set at ≥ 75 and classical completeness is set at $\geq 85\%$. After the posttest is done, students are asked to fill in the response questionnaire and questionnaire of interest in learning. The results of the response questionnaire can be calculated using the formula:

$$\% \text{ Response} = \frac{\text{Total score of each statement}}{\text{number of respondents}} \times 100\%$$

The results of students' interest in learning can be calculated using the formula:

$$\% \text{ Interest in Learning} = \frac{\text{Total score of each statement}}{\text{number of respondents}} \times 100\%$$

And expressed interest in learning when reaching reaches greater than 80%.

III. RESULTS AND DISCUSSION

The results of the study and discussion of the effect of the Chemistry Adventure game on learning interest and student learning outcomes are described as follows.

A. Student Learning Outcome

Data learning outcomes of students through *pretest* and *posttest* written by the amount of matter. The results of the scores obtained and the results of normality testing are presented in Table 1 below. Because sig is greater .05 then the pretest group score and the posttest group score are normally distributed, meaning that a paired t test can be performed and calculated with the help of the SPSS program.

TABLE 1. RESULTS OF NORMALITY TEST AND t PAIRED

Score	Amount of learners	Average	Lowest	Highest	Sig	Note	df	t count	t table ($\alpha = 1\%$)
Pretest	33	13.57	0	24	.305	Normal	32	43.32	2.46
Posttest	33	81.87	60	100	.167	Normal			

Results of paired t test obtained t (43.32) is greater than t table (2.46), then H_0 is rejected, meaning that there is a significant difference (1%) between the score average pretest with a score average posttest and score posttest high. meaning that there is a significant difference (1%) between the score average pretest with a score average posttest and score posttest higher .

Pretest scores obtained by students indicate that all students experience incompleteness. Criteria participants declared complete if the student has reached criteria minimum completeness, namely 75. After learning to use the game Chemistry Adventure 's core posttest results indicate a score below 75 as much as 4 students or 12% and was obtained at 29 students or 87.8% achieved a score

equal to and above 75 (≥ 75) , meaning that the posttest score had met classical completeness.

The above results can be said that the game can require students to achieve classical completeness and there is a significant difference between the pretest score and posttest score. And the game can lead students to apply the ideas and knowledge they have directly in game activities related to subject matter [11]. The levels in the Chemistry Adventure game can help develop students' thinking habits in the realm of chemistry because the questions presented are also increasingly difficult from level to level. Besides this Chemistry Adventure game can also improve students' memories of the Chemistry Bond material due to the demand for mastery of concepts in order to answer questions correctly and be able to finish the game according to certain standards.

B. Results Questionnaire Student Interest in Learning

Data on learning interest of students is obtained from the interest in learning questionnaire after using the Chemistry Adventure game. Learner preferences questionnaire indicators include: (a) love/pleasure in learning, (b) interest to the learning process, and (c) participation in learning activities. The following are the results of the student interest in learning questionnaires.

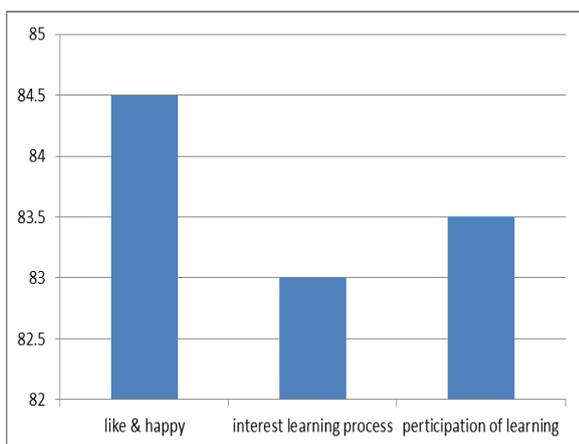


Figure 1 Student interest in learning

Based on Figure 1, the first indicator of students' interest in learning, that is feeling like/ happy in learning, obtained an average percentage of 84.5% with very high categories. This is in accordance with the expectation that learning games or games should be based on fun learning in addition to loading learning materials in it [12]. Feelings of joy that arise in learning is one indicator that students are interested in learning. With the feeling of pleasure, the students will pay attention without realizing it and enjoy the continuity of the learning process.

The second indicator of students' interest in learning that is interest in the learning process using the game Chemistry Adventure obtained an average percentage of 83.0% with a very high category. This game is one of the media that can be used by students to support the effectiveness and efficiency of the process of studying Chemical Bonding material. Students who are interested in the learning process will have a constant tendency to pay attention and remember something that is learned continuously [13].

The third indicator of students' learning interest, namely participation in learning activities using the Chemistry Adventure game, obtained an average percentage of 83.5% with a very high category. Learning media in the form of games have the advantage that the game allows the active participation of students to learn [14]. Games in learning will make students feel happy and encourage to study harder.

C. Students response result

Data on students' responses were obtained from students' response questionnaires after using the Chemistry Adventure game. Following are the results of the student response questionnaire presented in Table 2.

TABLE 2. STUDENT RESPOND RESULTS

Assesed Indicator	Percentage Average (%)
Student interest game	88.88
Ease of understanding material	81.81
The pleasure of studying chemistry	93.93

Based on Table 2, the percentage obtained in the first indicator shows the level of student interest in the game Chemistry Adventure is relatively high. The pleasure of using the game, the desire to use it again, and actions to recommend the game to other friends are indicators that students feel interested in using the Chemistry Adventure game.

The percentage obtained in the second indicator shows that the material in the Chemistry Adventure game is relatively easy to understand and this is supported through the ease in working on the post test. The ability to understand the material and do posttest related to the activities carried out by students. Students' activities show the extent of their ability to solve problems in games that are closely related to the achievement of learning objectives.

The percentages obtained on the third indicator show that the Chemistry Adventure game is easy to use. The ease of use is related to the easy operation of the game because all menus function well, the narration in the game is easy to read, as well as instructions and regulations that are made easy for students to understand so that the Chemistry Adventure game is very practical [15].

Based on the results of students' responses to the game Chemistry Adventure is classified as very good which can be seen in each indicator get a percentage of > 81%. This means that students give positive responses to the use of the Chemistry Adventure game as a medium of learning and it is also proven by the achievement of learning outcomes that have reached classical completeness.

IV. CONCLUSIONS AND SUGGESTIONS

A. Conclusion

Based on the results of research and discussion about the effect of the game Chemistry Adventure, it can be concluded as follows.

1. Learning chemical bonds using the Chemistry Adventure game can improve learning outcomes and achieve mastery learning.
2. Interests learners in chemical bonds to be high by using games as a medium .
3. Learners feel the learning chemical bonds he was using the game Chemistry Adventure fun.

B. Suggestion

In the research using the Chemistry Adventure game only for one class, so as to obtain information and broader and more accurate results, the Chemistry Adventure game can be continued with a broader target and using a control group. And the game was developed as a learning medium so that chemistry learning can make students learn with fun.

REFERENCES

- [1] Shelawaty, A.R., D. Hadiarti, and R. Fadhilah, "Development of flash media for chemical bonding materials for class X students of SMA negeri 1 pontianak," *Ar-Razi of Sci. J.*, vol. 4, no 02, ISSN. 2503-4448, 2016.
- [2] P.A. Huddle, M.A., White, and F. Rogers, "Using a teaching model to correct known misconception in electrochemistry," *J. of Chem. Educ.*, vol 77, no 1, pp. 104-110, 2000.
- [3] E.S., Wahyuni, and R. Hidayah, "Development of Quarchem Card Game Media to Practice Students' Analytical Thinking Skills in High School Grade X Chemistry Material Materials," *Proceedings of the National Chemistry Seminar and Learning*. ISBN: 978 - 602-0951- 12-6, 124-130, 2016.
- [4] D.D., Perdana, S.B., Utomo, and S. Yamtinah. "Efforts to increase learning interest and learning achievement in hydrocarbon material through the application of cooperative learning models type student team achievement division (STAD) assisted by problem cards in class X students even semester of SMAN 8 Surakarta in 2012/2013 Academic Year," *J. of Chem. Educ.*, vol. 3, no. 1, ISSN: 2337-9995, 2014.
- [5] L. Saparwadi, "The Effectiveness of drill learning method with peer teaching approach judging from the interest and achievement of student mathematics learning," *J. of Math. Didac.*, vol. 3, no 1, ISSN: 2355-4185, 2016.
- [6] F.P. Yunitasari, and R. Agustini, "The development of game media 7 icon chemistry in chemistry bonding materials to improve learning outcomes of class X high school students," *Unesa J.1 of Chem. Educ.*, Vol. 2, No. 3, ISSN 2252-9454, 2013.
- [7] C. Mangiron, "Game on! Burning issues in game localization," *J. of Audiovis. Transl.*, Vol. 1, No. 1, pp. 122- 138, 2018.
- [8] P.M. Noemi, and S.H. Maximo, "Educational games for learning," *Univ. J. of Educ. Rsc.*, Vol. 2, No. 3, pp. 230-238, DOI: 10.13189/ujer.2014.020305, 2014.
- [9] D. Meier, *The Accelerated Learning*. Bandung: Kaifa, 2018.
- [10] S.S. Qomariah, "Quality of learning media, learning interests, and student learning outcomes: study of economic subjects in class X IIS 12 Public High School Jakarta," *Jurnal Pendidikan Ekonomi dan Bisnis*, Vol. 4, No 1, E-ISSN:2302- 2663, 2016.
- [11] S.E. Smaldino, D.L Lowther, and J.E. Russell, *Instructional Technology and Media for Learning: Teknologi Pembelajaran dan Media untuk Belajar*. Alih Bahasa Oleh Arif Rahman. Jakarta: Kencana, 2011.
- [12] Darmawan, "The Use of Problem Based Learning in Improving Students' Critical Thinking Ability in Social Studies Learning at MI Darrusaadah Pandeglang," *J. of Educ. Rsch.*, Vol. 11, No.2., 2010.
- [13] M. Olsson, P. Mozelius and J. Collin, "Visualisation and Gamification of e-Learning and Programming Education," *The Electronic Journal of e-Learning Volume 13 Issue 6 2015*, (pp441-454) available online at www.ejel.org, 2015.
- [14] Slameto. *Learning and Factors That Influence It*. Jakarta: Rineka Cipta, 2010.
- [15] Aprianto and A. Lutfi, "Development of The Adventure Of Element Based On Role Playing Game As A Learning Media On Element Chemistry Matter. Proceedings of the Seminar National Kimia-National Seminar on Chemistry," *Advances in Engineering Research*, volume 171. Atlantis Press, pp 223- 228, 2018.

