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DEVELOPMENT OF MOBILE GAME CHEM MAZE AS MEDIA IN CHEMISTRY LEARNING AT MAIN TOPIC PERIODIC SYSTEM OF ELEMENT IN CLASS X

Imroatuz Zakiyah and Sri Poedjiastoeti
Jurusan Kimia FMIPA Universitas Negeri Surabaya
Hp: 085692303102, e-mail: zakizakiyah03@gmail.com

Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan *mobile game Chem Maze* yang dikembangkan sebagai media pembelajaran kimia pada materi pokok sistem periodik unsur. Metode penelitian yang digunakan adalah *Reasearh and Development* (R&D) yang meliputi potensi dan masalah, pengumpulan data, desain produk, validasi desain dan uji coba produk. Uji coba dilakukan pada 10 orang siswa kelas X IPA di SMA 1 Sooko. Hasil penelitian menunjukkan bahwa *mobile game Chem Maze* pada meteri pokok sistem periodik unsur yang dikembangkan layak secara teoritis dan empiris digunakan sebagai media pembelajaran. *Mobile game Chem Maze* dinyatakan layak secara teoritis didasarkan pada aspek kualitas isi dan tujuan, kualitas instruksional dan kualitas teknik yang memperoleh persentase sebesar ≥ 61%. *Mobile game Chem Maze* dinyatakan layak secara empiris didasarkan karena mendapatkan respon positif dari siswa dengan memperoleh persentase sebesar ≥ 61% pada setiap komponen untuk masing-masing tujuan. Selain itu diperkuat dengan observasi aktivitas siswa yang mendapatkan persentase ≥ 61% pada setiap komponen untuk masing-masing tujuan. Serta didukung dengan hasil tes belajar yang dilihat berdasarkan hasil *pretest* dan *posttest* yang mengalami peningkatan ketuntasan klasikal dari 30% (*pretest*) menjadi 100% (*posttest*).

Kata Kunci: *Mobile game Chem Maze*, sistem periodik unsur, kelayakan media

Abstract

The aims of this research is to know the feasibility of mobile game Chem Maze that had been developed as learning media at main topic periodic system of elements.The method that used was research and development (R&D) includes potential and probem, collecting data, product design, validation and test of product. Limited test do to 10 students class X IPA in SMA 1 Sooko. The result of these research show that mobile game Chem Maze at main topic periodic system of elements which develop is feasible theoretically and empirically used to be learning media. Mobile game Chem Maze declared feasible theoritically based on aspects of content and objectives quality, instructional quality and techniques quality which obtain percentage ≥ 61% in all of component in every aspect. Mobile games Chem Maze declared feasible empirically based on positive response from student and get percentage ≥ 61% in each component for each objective. Beside that reinforce with observational student activity which get percentage ≥ 61% in each component for each objective. And supported by learning outcomes which seen by the results of pretest and posttest which showed an increase of classical completeness from 30% (pretest) to 100% (posttest).

Keywords: *Mobile game Chem Maze, periodic system of elements, feasible of media*

INTRODUCTION

Along with the development of science and technology today, the issue of education to be one topic of conversation that invites the attention of many people, especially the government who always does the development and improvement in education. One of the government's development is to transform the KTSP curriculum into 2013 curriculum. 2013 curriculum intends to develop the potential of students to be reflective thinking skills in the settlement of social problems in the community, and to build a democratic people's lives better [1].

Learning process is a process of communication between source of the message is teacher and the recipient are students. If the process of communication between teacher and student fails it will cause an error of interpretation so that necessary learning media as learning source that can deliver the message. Selection of learning media consider the effectiveness, in order to assist students in the learning process especially in learning chemistry. One chemistry topic taught in class X is periodic system of elements. Based on field observations in class X IPA 4 in SMAN 1 Sooko who have received the material periodic system of elements 78.9% of students stated that the matter of the periodic system of elements is a difficult matter. This happens because the students thought that is complex matter, the matter is too much which makes it difficult to memorize, beside that lack of test which given by teacher also make it difficult to understand by the student. So need for an innovation in the presentation of chemical question that can attract students to practice working on chemistry, such as by presenting it in the form of games. This media is expected to overcome learning difficulties so that students can improve their learning outcomes.

According to Edward [2] game is a tool which is effective for teaching because it contains learning principles and effective instructional techniques which used as reinforcement in the levels of difficult learning. In addition, the game also able to shift the culture of traditional class or teacher center into student center [3]. The rapid growth of the game at this time it is possible to develop become educational games so that the next generation does not only play games for entertainment but rather as a learning tool.

According to Kesera [4] schools should start implementing educational games as learning media because the game can improve thinking ability of students while also improving students' creativity and visual capabilities.

Based on field observations 86.1% of students like educational games, students agreed if educational games used as learning media in chemistry on the material periodic system of elements, students argue if the chemistry learning using that media will be exciting, interesting, challenging, can sharpen the brain, innovative, easy in memorizing, exciting, not boring, can make students more comfortable in learning and making students do not surfeited. According to the survey 84.2% of students wanted the maze game which will be developed as a learning media. Maze is a puzzle in complex branching path form and has a lot of stalemate. The objective of the game is the player must find a way out of an entrance to the exit.

Challenges of 21st century is characterized by the rapid development of technology applied in various areas of life in society, including in connection with learning media. One example of the development technology are their smartphones and tablet computers. Both devices have function that is not much different from the computer but have more flexibility as small as a book so easy to bring it, the device can be used as a lerning media so that students can learn everywhere and everytime, it allows students to learn in a mobile or better known as mobile learning. Mobile learning can be attractively packaged in a mobile applications found on smartphones and tablet computers. An interesting idea if makes the game as learning tool.

Based on preliminary described above, the researchers wanted to develop a learning media for chemistry with title "Development Of Mobile Game Chem Maze As Media In Chemistry Learning At Main Topic Periodic System Of Elements In Class X**".**

METHOD

This research include in development research. This research refer to Research and Development (R&D). The research desain limted until development phase exactly in limited test [5].

The data source of development mobile game Chem Maze as learning media is 10 students of grade X of SMA 1 Sooko who have received periodic system of elements material. Assessment was also given by the lecturer of chemistry and chemistry teacher of SMA 1 Sooko and practitioners of LPMP Jawa Timur.

Before conducting limited trial, the media was reviewed by chemistry lecturer. After that the media was validated by 2 person chemistry lecturers, 1 person high school chemistry teacher and practitioner from LPMP Jawa Timur. After that pretest and posttest given, pretest conduct before student given game media and posttest given after using game media to determine improvement of learning outcomes. After that there are questionnaire responses that fill by student after conducting test. In addition there are observational student activity questionnaire that fill by observer when limited test was going on.

The method that used by researcher to obtain the data include test method, questionnaire method and observation method.

Analysis data from media reviewer by chemistry lecture like suggestion will be used to repair mobile game Chem Maze. Analysis of validation data by chemistry lecturer, chemistry teacher and practitioner score were descriptively analyzed quantitatively using Likert scale as in the table below :

Table 1. Likert Scale.

Assessment	Score
Very good	4
Good	3
Bad	2
Very bad	1

[6]

The data that obtain were analyzed by using equation :

$$P(\%) = \frac{\text{sum of collected data score}}{criteria\ \ score} \text{x } 100\%$$

$$criteria\ score = \text{highest score}\ x \sum aspect\ in\ criteria\ x \sum validator$$

Then from the result make a conclusion about feasibility of mobile game Chem Maze that developed by using score interpretation in the table below:

Table 2. Score Interpretation

Percentage (%)	Criteria
0 - 20	Very bad
21-40	Bad
41-60	Medium
61-80	Good
81-100	Very good

[7]

Based on criteria above, the media was feasible if the validation percentage ≥ 61%. For the result of student questionnaire responses and observational student activity are analyzed quantitatively using Guttman scale as the table below:

Table 3. Guttman Scale

Answer	Score
Yes	1
No	0

[6]

Data were analyzed using equation 1. Criteria for feasibility of student response and observational student activity using criteria Table 2. Based on that criteria the media was feasible if the percentage ≥ 61%. For the learning outcomes analyzed the individual or classical completeness. Student which complete the study if get score ≥ 75. While classical completeness will complete if 85% of student get score ≥ 75 [7]. The equation that used to calculate is

$$Classical\ completeness = \frac{Amount\ of\ complte\ student}{Amount\ of\ student} x\ 100\%$$

RESULT AND DISCUSSION

After getting advice from reviewer and media improvement have been made the

next step was validating the media to know the feasible of the media. The result of validation assessment given by validator will be shown in following Table 4.

Table 4. Validation Result

Aspect which Assess	Per-centage (%)	Criteria	
		Very Good	Good
Content and Objective Quality			
Completeness	90.62	√	
Balance	84.38	√	
Compatibility	87.5	√	
Instuctional Quality			
Giving help for learning	81.25	√	
Motivation quality	87.5	√	
flexibility	92.19	√	
Technic Quality			
Linguistic	89.06	√	
Easy to use	84.38	√	
Display quality	90.63	√	

Based on the table above giving help for learning component get the lowest percentage is 81.25%, but included in very good category. This is in accordance with Education and Culture Ministry No. 69 Year 2013 [1] on improvement of the mindset of 2013 curriculum that the pattern of teacher-centered learning be learner-centered and isolated learning patterns into a learning network so students can gain knowledge from anyone and anywhere. While getting a lower percentage than the other components, but use of mobile game Chem Maze can optimize learning independently as expected in the theory of constructivism that students find and transfer the information obtained to himself with a student-centered learning and the teacher acts as a facilitator and motivator in learning [8] So mobile game Chem Maze also optimizes the theory of constructivism as the optimizer information so that students better understand the material.

Overall mobile game Chem Maze included in the category of very good or very feasible because in all aspects which assessed get a percentage ≥ 61%. It is shows that mobile game Chem Maze which developed feasible to use for student learning media. Overall results of the validation is also supported by the theory which presented by Sudjana & Rivai was learning media occupy an important position in the learning process so that if there is no media, communication process will not take place optimally [9]. According to Sadiman, media is anything that can be used to deliver a message from the sender to the receiver so can stimulate the mind, feelings, concerns and student's attention so learning will occurs [10]. By looking at the percentage of the validation results, it can be concluded that mobile game Chem Maze can be used as a learning media at periodic system of elements material to deliver a message from the teacher to the student.

Once declared valid then performed limited testing in SMA 1 Sooko Mojokerto in grade X IPA with 10 students which is heterogeneous both in the level of ability or gender. Limited test begins with checking the students 'prior knowledge by giving pretest and then given treatment mobile game Chem Maze media, after that posttest was conducted to determine the increase in students' understanding. The data is used to support the result of student response. The following data of student learning outcome are presented on Table 5.

Based on table it is known that when pretest only 3 students who completed while at posttest all students complete. These data shown the mobile game Chem Maze give good impact on learning outcomes of students with there are increasing in the classical completeness of

students from pretest to posttest, ie from 30% to 100%. Improved learning test results are consistent with studies of Nugroho which stating that mobile games can improve student learning outcomes [11].

Table 5. Student Learning Outcomes

Student	Pre-test Score	Completeness		Post-test Score	Completeness	
		Complete	Not Complete		Complete	Not Complete
1	75	√		91.67	√	
2	66.67		√	83.33	√	
3	50		√	83.33	√	
4	41.67		√	75	√	
5	58.33		√	83.33	√	
6	50		√	75	√	
7	75	√		91.67	√	
8	75	√		91.67	√	
9	41.67		√	83.33	√	
10	50		√	75	√	

The increase of classical completeness occurs because the media that used attract to students, this is in accordance with the opinion of Frietas which stating that the media game has its own advantages compared with other media because the media game makes learning more interesting, exciting, and not monotonous [12].

Data of feasible were also obtained from the student response questionaire that is presented in the Table 6. Based on the table the question about design, font color, background and picture were interesting get percentage only 70%, this is because the font design is too formal that makes students less interested, but still included in good categories. According Arsyad [13] one of the positive impact of the use of the media as part of learning is learning more interesting and fun. When students are given a stimulus of a game then the students will give more attention to the game consciously and will remember it because the game is fun nd then will process further as perceived.

Table 6. Result of Student Response

Question	Yes Answer		
	Percentage (%)	Criteria	
		Very Good	Good
a. Is that media is enjoyable learning media?	100	√	
b. Do you like study using learning media in game form?	100	√	
c. Is learaning using learning media can help you to understanding the concept of periodic system of elements?	80	√	
d. Is the learning media interesting?	100	√	
e. Is the desain, font color, background and picture in learning media interesting?	70		√
a. Is the language in the learning media easy to understand?	100	√	
b. Is the fornt that use in learning media easy to read?	90	√	
c. Is navigation button (mneu, back, dst) easy to use?	70		√
d. Is the color selection in media appropriate?	70		√
e. Is the story plot in these learning media easy to understand?	70		√
f. Is the game instruction in learning media easy to undertand?	100	√	
g. Is the systematic desain material in the learning media good?	90	√	
a. Do you enjoy doing the question in learning media?	90	√	
b. Is tthat media can improve your learning spiritin study?	100	√	

Continue of Table 6. Result of Student Response

Question	Yes Answer		
	Percentage (%)	Criteria	
		Very Good	Good
c. Do you motivate to study periodic system of elements using these learning media?	90	√	

Mobile game Chem Maze is expected to perceive the students and can make students pay more attention because of the learning process fun. So the development mobile game Chem Maze can support information process theory Beside that, there are 3 other question that gets the percentage is only 70% that is easy to use navigation buttons, attractive colors, the storyline is easy to understand. This maybe cause some student's Smartphone while using this game slow this may occur because the system memory of student's Smartphone is full, beside that may be less flashy colors used but third's statement still in good categories

Overall the students' response to the mobile game Chem Maze is very good because student interested and like to use this media and also the media can improve spirit of the student's learning so mobile game Chem Maze can be declared feasible as an instructional because it gets very good response and got percentage ≥ 61% in all of aspect which assess. This is show that mobile game Chem Maze has affective function, arouse students' enjoyment of learning [13]. Also according Sudjana and Rivai one of the benefits of the media is teaching will attract more attention so can motivate students [9].

In addition to support student questionnaire responses, there are other data obtained from the observational student activity during limited test. The following will be presented in the Table 7.

Table 7. Result of Observational Student Activity

Aspect Which Observe	Yes Answer		
	Percentage (%)	Criteria	
		Very Good	Good
a. Student enthusiastic when following earning process with use these learning media	100	√	
b. Student not feel bored when using these learning media	100	√	
a. Student can understand mobile game Chem Maze instruction easily	100	√	
b. Student not experience difficulty mehen operate these learning media	80	√	
c. Student not asking about how to use mobile game Chem Maze because they understand the fuction of all of navigation button in these learning media	70		√
d. Student doing well when using mobile game Chem Maze without asking in centain frame	80	√	
a. Student undertand all of material which showed in these learning media	90	√	

Continue of Table 7. Result of Observational Student Activity

Aspect Which Observe	Yes Answer		
	Percentage (%)	Criteria	
		Very Good	Good
b. Student not dishonest when use these learning media like open a book or asking friend	90	√	
c. Student not asking about evaluation question	90	√	
d. Student doing question in learning media	100	√	

Based on the table above, there is one aspect that gets the percentage is only 70% that is the aspect of the students do not ask questions about how to use the media. This is because there are three students who asked about navigation buttons that do not run smoothly, how to open material assistant as well as a way to close it. This happens probably because the memory system on student's smartphone is full so make game run slower and students less careful in reading the information contained in the material assistant. But overall this is supported by the theory according Sadiman [10], which states the game is flexible. So that game will be easier for students to use. The game can be used for various educational purposes by changing a little tool, rules, or problem. But overall all aspects that observed get percentage ≥ 61% and included in the good and very good category. So it can be said that mobile game Chem Maze is feasible used as a learning media because it can cause the student activity.

CLOSURE

Conclussion

Based on the analysis of the research results and discussion, it can be concluded that mobile game Chem Maze which developed feasible for use as a learning media at main topic periodic system of elements in class X, with details of the following results:

1. Mobile game Chem Maze declared feasible theoretically as a learning media in chemistry learning at main topic periodic system of elements in class X. Feasibility is based on aspects of content and objectives quality, instructional quality and techniques quality which obtain percentage ≥ 61% so that is included in very good category in all of component in every aspect.
2. Mobile game Chem Maze declared feasible empirically as a learning media in chemistry learning at main topic periodic system of elements in class X. Media which developed get positive response from students and get percentage ≥ 61% in each component for each objective which included in the category good and very good. Additionally reinforced with observational student activity which gets percentage ≥ 61% in each component for each objective which included in category good and very good. And supported by learning outcomes which seen by the results of pretest and posttest. Based on these data showed an increase of classical completeness 30% (pretest) to 100% (posttest).

Suggesstion

Based on the research results and conclusions described above, subsequent researchers gave suggestions to further research. As for the suggestions are:

1. Mobile game Chem Maze can be developed in other chemical materials

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2. Media is equipped with the sound of music students should use the headset so that the music sounds not distrubt other friends concentration.

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