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Development of Learning Games toward Informatics Subjects in Class VII SMP

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Abstract

This research is motivated by several facts found in the field. Students still find it difficult to understand some of the Informatics subject matter because the material is quite complex. This is because apart from the material being quite difficult to understand, the Informatics subject is new for class VII students. Problems related to students not understanding the material at SMP Negeri 15 Padang class VII are caused by monotonous learning and teachers rarely use learning media during learning activities. This research aims to produce learning game media for class VII junior high school Informatics subjects that are valid, practical and effective. This type of research is development research, known as Research and Development (R&D), using the 4-D development model. The development procedure in this research consists of 4 stages, namely; (1) Define, (2) Design, (3) Develop, (4) Disseminate. The product validity test was carried out by 3 validators, namely 1 material validator and 2 media validators. Product trials were carried out on 31 class VII students of SMP Negeri 15 Padang with the aim of finding out the practicality and effectiveness of the product being developed. The development of this learning game media has been validated by 1 material expert and 2 media experts, whose respective assessment results have been categorized as "Very Valid" with an average score of 98.35% for the material, and 97.98% for the media used went through 2 validation stages with several revisions to the media. The results of practicality trials in the field obtained a score of 98.12%, so that the learning game media is in the "Very Practical" category. Based on the results of the validity test, and practicality test, it can be concluded that the resulting learning media is suitable and can be used in Informatics subjects for class VII SMP.

Keywords: *Development, Media, Learning Games, Articulate Storyline.*

Abstrak

Penelitian ini dilatarbelakangi oleh beberapa fakta yang ditemukan dilapangan. siswa masih sulit untuk memahami sebagian materi pelajaran Informatika karena materinya cukup kompleks. Hal tersebut dikarenakan selain materi yang cukup sulit dipahami karena mata pelajaran Informatika baru bagi siswa kelas VII. Permasalahan terkait ketidakpahaman materi siswa SMP Negeri 15 Padang kelas VII disebabkan pembelajaran yang monoton selain itu guru jarang menggunakan media pembelajaran saat kegiatan pembelajaran. Penelitian ini bertujuan untuk menghasilkan media *game* pembelajaran pada mata pelajaran Informatika kelas VII SMP yang valid, praktis, dan efektif. Jenis penelitian ini adalah penelitian pengembangan yang dikenal dengan istilah Research and Development (R&D), dengan menggunakan model pengembangan 4-D. Adapun prosedur pengembangan pada penelitian ini terdiri dari 4 tahap yaitu; (1) *Define*, (2) *Design*, (3) *Develop*, (4) *Disseminate*. Uji validitas produk dilakukan oleh 3 validator yaitu I orang validator materi dan 2 orang validator media. Uji coba produk dilakukan kepada 31 siswa kelas VII SMP Negeri 15 Padang dengan tujuan untuk mengetahui kepraktisan dan efektivitas produk yang dikembangkan. Pengembangan media *game* pembelajaran ini telah divalidasi oleh 1 orang ahli materi dan 2 orang ahli media, yang hasil penilaiannya masing-masing sudah dikategorikan "Sangat Valid" dengan rata-rata nilai 98,35% untuk materi, dan 97,98% untuk media yang melalui 2 tahap validasi dengan beberapa revisi pada media. Hasil uji coba kepraktisan dilapangan memperoleh nilai 98,12%, sehingga media *game* pembelajaran berada pada kategori "Sangat Praktis". Berdasarkan hasil uji validitas, dan uji praktikalitas, dapat disimpulkan bahwa media pembelajaran yang dihasilkan ini layak dan dapat digunakan pada mata pelajaran Informatika kelas VII SMP.

Kata Kunci: *Pengembangan, Media, Game Pembelajaran, Articulate Storyline.*

INTRODUCTION

Advances in information and communication technology in the field of education have given teachers and students several options for selecting or developing teaching materials used in classroom teaching. The implementation of information technology in the educational process, however, tends to provide many variations in learning media, which will be beneficial for professional student learning outcomes (Ramdhani & Wulan, 2012). In addition, learning through the use of multimedia tools has a positive effect on both learner attitudes and motivation as well as learning outcomes (Ramdhani & Muhammadiyah, 2015). Therefore, it is important for teachers to teach their students about the diversity and growth of teaching materials used during the teaching process so that in the end they are able to develop their own

teaching materials, such as multimedia which combines information and communication technology, which will excite and encourage students to study harder. .

The incorporation of information technology into human life today does more than facilitate the rapid dissemination of information; On the other hand, various gadgets that are already widely used will become necessities. Today, people cannot function without devices such as tablets, smartphones, and PDAs. They are not only used for social media and communication, however as a means of playing video games. According to Millward Brown, a person can spend up to 7 hours per day using a smartphone, which is the most commonly used device in most countries (Millward Brown, 2014). These statistics are provided by Child wise, which states that in 2017 54% of children used smartphones every day to listen to music, 51% to watch videos, 41% to play games, and 60% to browse the internet or do other online activities. . Today, smartphones have become a necessity for listening to music, using the internet, playing games, watching videos, and reading, as well as serving as a source of portable entertainment for young children (CHILDWISE, 2017). New information about the use of the number of data access packages on gadgets was obtained from Nusa research, which polled 2,824 respondents. The results reveal that the majority of men and boys use or handle data packages more often than women. Apart from that, a fairly large data package can be used to access YouTube videos, play games and access social media. Observing the large number of people who use gadgets to play video games, with the majority of users being children, educators are advised to encourage people to use smartphones not only for playing digital games but also for communication with children, as well as encouraging them to use or continue to play the intended games for them. In addition, educators can incorporate these games into the learning process.

The best activity for children to gather knowledge is through play activities. The play activities referred to here are basic activities carried out by children alone or with teachers, family members, peers and parents. These activities are carried out without coercion and voluntarily, to please the children themselves, through playing children will feel satisfied. Can understand various rules, can socialize and work well together. According to Tedjasaputra, the essence of playing is for children to learn because through playing children can improve their abilities and be able to develop themselves (Azizah, 2016). If played properly, it can benefit students a lot. Playing games can not only improve children's social, emotional and language skills, but playing games can also improve children's cognitive development. In addition, playing games with pen and paper makes it easier to explain the concepts contained in the learning material. A baby can develop their motor skills through playing, but they can also develop physical, cognitive, linguistic, emotional, social and imaginative skills (Rais et al., 2018). The many benefits of this gaming initiative include the fact that playing can help develop early childhood, as stated by Montessori (Suyadi, 2014).With the rapid development of information and communication technology in this century, gaming activities can not only be carried out through real games, but also through virtual games that are consolidated on global servers, and player figures are represented by animation and movement. Playing animated video games is possible by utilizing electronic media such as smartphones which can support digital video games (Rais et al., 2018). Technological developments have made children increasingly addicted to smartphones, which places the responsibility on parents and educators to evaluate and guide students, and to be able to choose games that not only entertain but also educate children (Fujiati, Nasari, Rahayu and Sanjaya, 2018). There are 17 (seventeen) game categories that Android smartphone users can choose and download based on the game categories in the Play Store. This category includes arcade, racing, card, casino, text, action, music, sports, board games, educational games, adventure, real player games (RPG), casual games, simulation, strategy, puzzles, and trivia (guessing).). Of all these categories, games in the arcade category (Subway Surfers by Kiloo) are the most downloaded games (Panier, 2019). Even though learning games are a separate

category, the number of games in the educational category is still relatively small compared to other categories. This is certainly an opportunity for educators to develop various learning games. Some researchers in the field of education believe that learning games have many uses, one of which is that they help focus skills and attract more attention than other teaching methods (Turan, Köklükaya, & Yıldırım, 2020). Several previous studies have shown that computer games or video games actually have a positive and effective effect on the reinforcement learning process (Baek, Park, and Han, 2016). Apart from that, playing games can also improve the development of brain function (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012). Incorporating educational games into mathematics learning can significantly improve number recognition in elementary school students (Nagle, Wolf, Riener, & Novak, 2014).

Informatics is a replacement for the ICT (Information and Communication Technology) subject which was initially only a local content or skill in the K13 Curriculum, but now in the Independent Curriculum it is one of the subjects. Compared to ICT subjects, Informatics is given more space and targets for the learning process in schools. We can see this from the class hours, where in the ICT subject there is only 1 JP and the rest is guidance while in the Informatics subject it is 3 JP. It is actually written in Minister of Education and Culture Regulation No. 36/2018, there is an amended article, namely article 10A: Implementation of Informatics learning as an elective subject will be implemented starting in the 2019/2020 academic year according to school readiness. Returning ICT to a subject is part of the Ministry of Education and Culture's strategic steps in facing the challenges of the industrial revolution 4.0. The concept of Informatics subjects is slightly different from ICT subjects. Informatics subjects not only study various computer devices, but also problem solving, critical thinking and students are required to think computationally by studying various scientific disciplines.

The development of this learning game uses software, namely Articulate Storyline 3. Articulate Storyline 3 is a multimedia authoring tool that can be used to create interactive learning materials with content in the form of a combination of text, images, graphics, audio, animation and video as web media (html5) or as an application file that can be run on various devices such as laptops, tablets and smartphones. According to the opinion of (Mallu & Samsuriah, 2020), Articulate Storyline media is software used as a medium for presenting and conveying information. This media is very suitable for supporting the learning process and competes with Adobe Flash media which is usually used to create interactive media, while Articulate Storyline media does not require a programming language during the creation process. That way, using this application during learning will be very interesting. This application allows educators to realize their creativity to a higher level. Educators can also easily visualize the stories they are telling in storyline form. Based on the description above, the author is interested in conducting research with the title Learning Game Development in Class VII Informatics Subjects.

METHOD

The type of research used is Research and Development (R&D) research. According to Sugiyono (2018:297) research and development methods are research methods used to produce certain products and test the effectiveness of these products. In developing this learning game, researchers used the 4-D model (Four D model) developed by Thiagarajan (1974). In this research, the researcher as developer chose the Thiagarajan (4-D) development model because it was adapted to the specifications of the product to be produced.

This 4-D model has four stages in the development process, namely; Define (defining), Design (planning), Development (development), and Dissemination (dissemination).

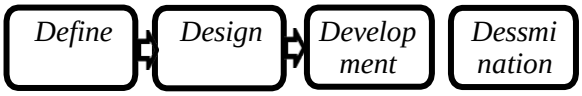

Figure 2. Chart of 4-D development research steps

1. Define Stage (Definition)

The aim of this stage is to raise and determine the basic problems encountered in the Informatics subject for class VII SMP so that the development of learning game media is needed. In this research, there were four steps carried out by researchers, namely:

a. Curriculum analysis; In designing learning game media it is closely related to the curriculum, namely to find out what indicators students must achieve in learning so that Learning Outcomes can be achieved.

1) Learning outcomes
   a) Students are able to describe the meaning, function and workings of computer hardware and software

2) Learning Objectives
   a) Get to know computer hardware and software
   b) Explain the types of computer hardware and software
   c) Explain how a computer system works

b. Student analysis; this analysis is carried out by considering students' characteristics, abilities and experiences. Student analysis includes characteristics, academic abilities, age and motivation for learning.

c. Concept analysis; Concept analysis is intended to identify, detail and systematically organize relevant concepts that will be taught based on curriculum analysis. This analysis is the basis for developing learning objectives.

d. Analysis of learning objectives; At this stage, it is carried out to formulate the results of the concept analysis into learning objectives that students must achieve. A series of learning objectives is the basis for designing learning tools and tests.

The research involved 31 class VII students at SMP Negeri 15 Padang. Product validation involves one material validator and two media validators. The object of this research is learning game media in the Informatics subject, Computer Hardware and Software material. Media implementation was carried out in 2 meetings.

2. Design Stage (Designing)

The design stage is the stage for designing a product that is in accordance with the results of the analysis that has been carried out previously. The aim of this stage is to prepare standards for designed learning game media products. The steps taken are:

a. Create a learning game media flowchart for the material.
b. Create storyboards

3. Development Stage (Development)

The aim of this stage is to produce a revised product based on input from validators. This stage carries out product development, validity and practicality testing.

4. Dissemination Stage (Dissemination)

The dissemination stage is the final stage in the 4D model. At this stage there are three activities, namely: validation testing, packaging, diffusion and adoption (Thiagarajan, 1974).

The data obtained is quantitative and qualitative data. Qualitative data was obtained from the validity of the questionnaire, the results of teacher responses, and the results of student responses to the media developed. Meanwhile, qualitative data is obtained from the interpretation of quantitative data, interview results, and also observation results.

The quantitative data analysis used by researchers is (1) Analysis of the level of validity of media and materials, and (2) Analysis of the level of practicality or student responses. The instrument used in this research was a questionnaire. A questionnaire instrument is used to measure the validity and practicality of learning game media. The formula used in analyzing validity is:

$$\bar{X} = \frac{\sum x}{n}$$

Information:

$\bar{X}$ = Average score

$\sum X$ = Number of values

n = Number of respondents

Determining the percentage value of validation results is done using the following formula:

$$\text{Percentage} = \text{x } 100\frac{Skor\ total}{Skor\ Maksimal}$$

Meanwhile, to find out practical results, use the formula:

Practicality Value = x 100$\frac{Skor\ di\ peroleh}{skor\ tertinggi}$

After the validity and practicality values are obtained, they are then categorized according to the level of validity and practicality as shown in the following table:

Table 1. Assessment Criteria

No.	Range	Category
1.	85.01%- 100%	Very Valid/Practical
2.	70.01% - 85%	Quite Valid/Practical
3.	50.01% - 70%	Less Valid/Practical
4.	01.00% - 50%	Invalid/Practical

Source: Akbar (2013:155)

RESULTS AND DISCUSSION

The development of learning games using computer hardware and software has the following description of results.

Define **(Definition)**

At this stage there are 4 things that must be done, including: curriculum analysis, student analysis, concept analysis, and goal formulation. In the curriculum analysis section, during the observation the researcher discussed with the Informatics subject teacher regarding the curriculum used at SMP Negeri 15 Padang, which was an independent curriculum and the topics to be developed were computer hardware and software material.

1. Learning Outcomes
   a. Students are able to describe the meaning, function and workings of computer hardware and software
2. Learning objectives
   a. Get to know computer hardware and software
   b. Explain the types of computer hardware and software
   c. Explain how computer systems work

Student analysis, Based on observations of class VII students at SMP Negeri 15 Padang, it is known that students have difficulty understanding computer hardware and software material because the computer laboratory at the school is under renovation so that during the learning process teachers have difficulty explaining the material without real media. The use of learning game media can help students understand and accept learning and can enable students to learn with high motivation. This can happen because of students' interest in learning game media which is able to attract students' interest in learning. Learning game media can clarify material and encourage students to learn independently and students can learn while playing so that the material can be easily understood and remembered.

Concept analysis, the main concept that students will learn is the concept of hardware and software. In this material, students have a little difficulty understanding the types of hardware and software, so they need a medium as an intermediary in conveying learning so that the material can be understood by students. Therefore, learning game media can help students understand the material while playing so that the lesson material is easier to remember and understand.

Formulation of goals, at this stage, it is carried out to formulate the results of the concept analysis into learning objectives that students must achieve. A series of learning objectives is the basis for designing learning tools and tests. The initial standard learning objectives for computer hardware and software are as follows:

1. Students are able to understand the meaning of computer hardware and software.
2. Students are able to understand computer hardware and software components.
3. Students are able to understand the functions of computer hardware and software.
4. Students are able to know how computer systems work.

Design **(Planning)**

This design stage has several steps that must be taken, namely as follows:

1. Media Selection (Media Selection)
   The choice of learning media in the form of Articulate Storyline based learning games is adjusted to the curriculum analysis, concepts and facilities provided by the school. This is based on Multiyaningsih (2016) that choosing learning media is appropriate to the material and characteristics of students.
2. Format Selection
   The choice of format in developing learning tools aims to formulate the design of learning media, selection of strategies,

approaches, methods and learning resources (Maydiantoro, 2021). The choice of format in developing learning media is intended as a guide in designing or designing learning content. The format chosen meets the criteria of being interesting, simple, and makes it easy to learn computer hardware and software material.

3. Initial Design

Initial design is how a teacher designs an effective and efficient learning process that can achieve learning goals (Edward, et al, 2022). At this stage, it is found out about the media flow that will be selected and developed. After analyzing the curriculum, researchers began to design learning media. This media was designed and shown to class VII junior high school students at SMP Negeri 15 Padang where researchers conducted trials. The steps for creating learning game media include the following:

a. Create Flowcharts

A flowchart is a comprehensive development of a program flow made with certain symbols. With a flowchart, the program flow from the beginning to the end of the program can be depicted in its entirety. Using a flowchart can help make it easier to work on media in a directed manner.

b. Create Storyboards

Storyboard contains visualization of learning game media which contains explanations on each media page.

***Development* (Development)**

This development stage has several steps, including:

1. Product Development

Product development can be done after designing flowcharts and story boards. This research develops a learning media, namely learning game media in the Informatics subject for class VII SMP. This learning media uses Articulate Storyline software with HTML 5 format for Web and Android.

The product display is presented in the table.

Table 2. Learning Game Display

Part	Appearance
Initial display	
Main menu/home	
Instructions for using the game	
Material display	
Game view I	
Game view II	
Game view III	
Display of correct answers in the game	
Finished view	

Exercise view

End of workout view

Profile view

2. Validity test
   Media validation data was obtained from two media validators, namely lecturers in Curriculum and Educational Technology, Padang State University, namely Mr. Nofri Hendri, M.Pd and Mr. Septriyan Anugrag, S.Kom., M.Pd.T through assessment sheets and one material expert, namely Informatics subject teacher, Mr. Ikhsan Putra, S.Kom. These results were obtained from material experts with an average percentage value of 98.35%, which is in the very valid category. Furthermore, for expert media validators, the average total percentage value from media validators was 97.98%. So it can be concluded that the results of the validation of learning game media are categorized as very valid.
3. Practicality Test
   The assessment was carried out on class VII SMP students, the activity was carried out to determine the extent of the assessment of the presentation of the material and the usefulness of the learning media by the students. The first week the researcher entered class VII.1 accompanied by the Informatics subject teacher to explain material about computer hardware and software. Then the researcher returned in the second week by presenting a learning game media accompanied by direct explanations by the researcher to determine the level of students' understanding. After showing the media and explaining the material, the author distributed media practicality questionnaires to students. The learning game media for the material "Computer Hardware and Software" is categorized as very practical with an average percentage value of 98.12%. This means that learning game media gets a positive response from students. Based on these results, this learning game media is feasible.

***Dissemination* (Deployment)**

At this stage, researchers distribute or promote the final product in the form of Articulate Storyline-based learning game media on flash disks and Google Drive. The researcher carried out the distribution phase to class VII middle school teachers in several schools, including SMP Negeri 15 Padang, SMP Negeri 18 Padang, and SMP Negeri 29 Padang. Apart from that, it can also be downloaded by teachers and students using the Google Drive link provided. This received a positive response, that the product developed by the researcher was interesting and could be used as a new learning medium.

CONCLUSION

Development of Learning Games in Informatics Subjects for Class VII SMP follows and uses R&D (Research and Development) development procedures and the 4D Development model. Based on description, data analysis and Development of learning game media in Informatics Subjects for Class VII SMP. It can be concluded that validity was carried out by 1 material expert and 2 media experts, whose respective assessment results were categorized as "Very Valid" with an average score of 98.35% for material, and 97.98% for media that went through two validation stage with several revisions to the media. The results of practicality trials in the field obtained a score of 98.12%, so that the learning game media is in the "Very Practical" category.Based on the results of the validity test and practicality test, it can be concluded that the resulting learning media is feasible and can be used in Informatics subjects for class VII SMP.

SUGGESTION

Based on the conclusions above, the suggestions that the author can give are as follows:

For users of learning media products developed in this development research, it is hoped that they can be used as an alternative for learning media and as a reference for subsequent development.

Schools should provide additional knowledge to teachers regarding learning media that can be used in the learning process, whether by bringing in educational science experts, attending seminars and workshops related to learning media so that teachers can help and develop it as a good and appropriate learning media.

This development research is still limited to Informatics subjects with limited discussion. Therefore, it is hoped that there will be more complex research and a wider scope.

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