
Development of Technology-Based Number Calendar Learning Media on Prime Numbers in Elementary School

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Abstract. The purpose of this research was to develop technology based on numeric calendar learning media on prime numbers in elementary as a support for proper learning. The feasibility of the media in terms of material and media aspects. Feasibility of the material consist of learning and content aspects. While the feasibility of the media includes aspects of display and programming. The method use in this research was 4D through 4 stages of development; define, design, develop, and disseminate. The media was validated by material and media experts, and the subjects in this research were 9 fourth-graders of SDN 11 Pekanbaru. The results of the content expert validation were 90% and the media expert validation was 72%. The results of students' responses amounted to 87% for small group trials and 91% for large group trials. So that the technology-based numerical calendar learning media on prime number material for elementary schools is feasible based on the experts' judgment and students' positive responses.

Keywords: Learning Media, Prime Numbers, Technology-Based Media.

Abstrak. Penelitian ini bertujuan untuk menghasilkan media kalender bilangan berbasis teknologi pada materi bilangan prima yang layak sebagai penunjang pembelajaran. Kelayakan media ditinjau dari aspek kelayakan materi dan media. Kelayakan materi meliputi aspek pembelajaran dan aspek isi materi, sedangkan kelayakan media meliputi aspek tampilan dan pemrograman. Metode yang digunakan dalam pengembangan media kalender bilangan berbasis teknologi adalah model pengembangan 4D yang terdiri dari 4 tahapan pengembangan yaitu define, design, develop, dan disseminate. Media divalidasi oleh ahli materi dan ahli media, sedangkan subjek uji coba kelayakan media yaitu 9 orang siswa kelas IV SD Negeri 11 Pekanbaru. Hasil validasi ahli materi sebesar 90% dan ahli media sebesar 72%. Hasil respon peserta didik sebesar 87% untuk kelompok kecil dan 91% untuk hasil uji coba terbatas. Oleh karena itu, media pembelajaran kalender bilangan berbasis teknologi pada materi bilangan prima untuk sekolah dasar dikatakan layak berdasarkan validitas ahli dan respon positif dari peserta didik.

Kata Kunci: Media Pembelajaran, Bilangan Prima, Media Berbasis Teknologi.

INTRODUCTION

In the teaching and learning process, these are two very important element which is learning method and learning media. A good learning process is learning that uses the right method also the use of media that can help the teaching and learning process. According to Kurniawan (2015) learning media are all forms of tools that can help deliver material to students that are used to stimulate students' thoughts, feelings, attention and abilities or skills to encourage the learning process of these students. In the point of view of mathematics education, the media are better known as mathematics teaching aids which are defined as a tool to make it easier to explain mathematical concepts and aim to enhance the quality of teaching and learning activities (Nasaruddin, 2018) .

Mathematics is an abstract science that contains a lot of space and numbers. Abstract science that is difficult to understand, this is the cause of the lack of students understanding mathematics subjects which have an impact on decreasing motivation to learn mathematics (Fowler in Sundayana, 2015). Therefore the task of educators is to create a learning atmosphere that is fun and close to the environment of students. However what happens in schools, learning mathematics is still monotonous and does not even use learning media. Especially in learning mathematics with prime numbers in grade IV elementary school, if it is adjusted to the 2013 curriculum which is updated on the cognitive aspect, children are required to be able to explain the meaning of prime numbers and for the skill aspect, children are expected to be able to identify prime numbers. Nevertheless the teacher still dominates the learning activities so that students become passive, less motivated, and get bored quickly. Mathematics learning is a teaching and learning process that is built by teachers to develop creative thinking that can improve students' ability to mathematics material (Zetra Hainul Putra, 2019). This fact needs to find a way out so that the learning process can be optimized. With the development of media or teaching aids in learning mathematics, it is hoped that it can help the process of delivering abstract mathematics into concrete in a more interesting and fun way.

Learning media that are often used in the learning process are *power point*, *prezi*, and *vi-learning* (Chou et al., 2015). The learning media used in the learning

process is more dominant in presentation and online-based applications, while the *vi-learning application* is used online to receive material in formats (*pptx, doc, and pdf*) and collect assignments independently. In general, the sophistication and progress of the developed media are rarely used in the learning process in elementary schools, especially learning mathematics. Based on some of the facts and problems that often occur, one solution that can be done is to develop mathematics learning media with a touch of technology so that the media is even more interesting and easy to convey learning messages to students. The development of technology-based number calendar learning media on prime number material in elementary schools is tailored to the needs of students and the demands of learning outcomes in a more interesting and fun presentation. Prioritizing the Erathosthenes filter concept which is supported by technology-based media so that it can be a solution to the above problems, and can also be applied to online learning.

THEORITICAL REVIEW

Technology-Based Learning Media

The word media comes from Latin and is the plural form of the word *medium* which literally means intermediary or introduction. *Medoe* is an intermediary or messenger from the sender to the recipient of the message (Sardiman, 2012). According to Heinich et al (Azhar, 2011) the term *medium* as an intermediary that delivers information between the source and the recipient. Thus, television, films, photographs, radio, audio recordings, projected images, printed materials, and the like are communication media.

Technology-based learning media are media that involve computers that present material using micro-processor-based sources (Muhson, 2010). The various applications used in the computer aim to present material in stages, tutorials, games, and simulations. More *Commission on instruction technology* (in Ramli, 2012) put forward a more general understanding, learning technology can be interpreted as a media that was born as a result of the communication revolution that can be used for learning purposes in addition to teachers, textbooks, whiteboards, while the

parts that make up learning technology are television, film, OHP, computers and hardware and software parts.

It can be concluded that technology-based learning media are learning media that use computer and telecommunications assistance in presenting and distributing learning materials to students in the form of video tutorials, games, or simulations. There are many forms of multimedia-based learning media that can be used to assist the learning process of students, such as: the use of textbooks, overhead transparencies, films, videos, slides, hypertext, web and so on. However, behind the sophistication of technology in the field of education also has a negative impact, one form of this impact is the emergence of a high dependence on machines or internet networks, without teacher control, students can easily access various things that have nothing to do with learning.

Technology-Based Number Calendar Learning Media

Media are all tools or intermediaries to convey a message or thing to the recipient (Azhar, 2011). Whereas in mathematics, mathematics education media are more likely to be called mathematics *manipulative materials* which can be interpreted as a tool that is overall used as a means of achieving goals to improve the quality of teaching and learning activities (Nasaruddin, 2018).

The word calendar comes from the modern English *calendar*. The term calendar comes from Middle English, which comes from the French *calandrier*, which comes from the Latin *calendar* which means bookkeeping notes for debts or loan interest notes. (Mansur, 2016). Number is a mathematical concept used for counting and measurement. In mathematics, a prime number is a natural number greater than 1, whose divisor is 1 and the number itself. A prime number is a number that has exactly two divisors, 1 and the number itself (Putra, 2020) It can be concluded that the number calendar learning media is a tool or intermediary to convey mathematical concepts to students using a calendar marking system for grade IV elementary school prime numbers.

Primes

When talking about prime numbers, the context of the conversation is generally limited to the set of natural numbers. The constraint becomes the context

of prime numbers can be defined as numbers that have only two divisors, namely 1 and the number itself (Abdussakir, 2014). Where there are only two divisors and no other divisors. Divisors can also be called factors. Examples of prime numbers that generally appear frequently are 2, 3, 5, and 7. Some prime numbers are even and some are odd. The even prime number is 2, and 2 is the only even prime number. Apart from 2, all prime numbers are odd numbers. If a number has a divisor other than 1 and the number itself, it is called a composite number, examples of composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, and 16.

Power point

Power Point is one of the media for delivering presentations which is a means of conveying visual information in oral presentations (Putra et al., 2019). In *Microsoft Power Point* there are menus that allow users to create and develop more interesting learning media. *Power point* as a multimedia application can combine all media elements such as text, images, sound and even video and animation. The information presented can be loaded and programmed in such a way that children will be more interested in learning.

The advantages of using *Power Point media* are that the media creation process is easier, more attention-grabbing because it is filled with various background colors, images, and animations or even sounds, it can be used anywhere so it is more flexible and simple, and *Power Point* is more effective so that educators no longer need to copy material on the blackboard (Chou et al., 2015). However behind these advantages, there are several disadvantages of using *PowerPoint in the field of education*, including: the cost of presentation is more expensive because *Power Point media* requires a laptop and projector in its presentation, requires educators who are not technology illiterate and have high creativity.

RESEARCH METHODS

This research on the development of technology-based number calendar learning media was carried out in Pekanbaru elementary schools. This research was conducted in July – August 2021. The place for the limited trial was at SDN 11 Pekanbaru in the odd semester of the 2020/2021 academic year.

The design of this research is development research using 4D research method. Where in this study follow the path developed by Thiagarajan et al., (1974). The main stages of the 4D development model are *define*, *design*, *develop*, and *disseminate*. Stage (1) *Define* is the stage to determine and define the requirements needed in the development of learning. Stage (2): *Design* aims to design learning tools and make initial product designs. Stage (3) *Develop* is the stage to produce development products which are carried out through two steps, namely expert appraisal (*expert appraisal*) followed by revision and developmental testing (*developmental testing*). Stage (4): *Dissemination* is a final stage of product development. Tiagarajan (1974) divides the disseminate stage into three stages, namely validation testing, *packaging*, and then *diffusion* and *adoption*.

The subjects of this research on the development of technology-based numeric calendar learning media were 9 grade 4 elementary school students at SD Negeri 11 Pekanbaru as well as material experts and media experts. As for the object of this study, it focused on the material of prime numbers in grade IV elementary schools and students of SD Negeri 11 Pekanbaru as a limited trial. The data in this study are: (1) Data from the assessment of media experts and material experts on prime number calendar media to see the feasibility of the media. The data source is taken from the lecturer through a validation test. (2) Questionnaire data on the developed product. Sources of data obtained from 9 fourth grade students. With data collection techniques using questionnaires or questionnaires and interviews.

Questionnaires were given to material experts, media, and students using a 5-choice Likert scale. The scores for the validation of material experts, media experts, and student responses are then analyzed and categorized based on table 1 below:

No	Number	Category
1	84-100%	Very good
2	68-83%	Well
3	52-67%	Enough
4	36-51%	Not enough
5	36%	Very less

Table 1. Criteria for Expert Validity and Student Responses

Based on criteria, the technology-based number calendar learning media that was developed if it gets a percentage result of $\geq 68\%$ is declared good and feasible to use.

RESULTS AND DISCUSSION

Media development must go through a product testing process which includes validation by material experts, media experts, small group trials and field trials. By conducting product trials through validation by experts, small group trials and field trials, the quality and feasibility of the media products being developed can be determined. The data obtained from the results of product trials in this study contained 4 data, namely: data from material experts, data from media experts, small group trials (3 people), and field trials (6 people). The data is in the form of responses about technology-based number calendar learning media products on prime numbers material. As for this study used 4D steps, namely *Define, Design, Develop, Dissemination*.

Define stage, a needs analysis is carried out to obtain information about the curriculum, learning objectives, student character, and analyze the material for prime numbers so that the usefulness of the product is obtained in accordance with the goals and objectives. By observing the fourth grade students of elementary school 125 Pekanbaru when the researchers conducted an internship (PLP) and analyzed the curriculum for prime number material, determining learning objectives and specific learning indicators for prime number material. It is known that the curriculum used is the updated 2013 curriculum, which can be seen in the use of the syllabus and lesson plans (RPP) used by fourth grade teachers during the classroom learning process.

Design stage is designing the product concept. At this stage the researcher has made an initial design (*prototype*). Broadly speaking, the content of technology-based number calendar media includes template design and materials. In addition, it is also necessary to prepare the necessary *software* in making media designs. The applications needed in developing technology-based number calendar media are presented in table 2.

Application	Stages
<i>Microsoft powerpoint</i>	Creation of media opening display Creating a menu selection display Competency display creation Material menu presentation Presentation of the training question menu Presentation of examples Number calendar main view
<i>iSpring suite</i>	Convert PPT to <i>HTML5</i>
<i>Website 2 APK builder</i>	Convert <i>HTML5</i> to <i>Android</i> -based APK format

Table 2. Stages of Making Media

Develop stage, at this stage the researcher assesses the feasibility of the product design to media experts and material experts, as well as conducts product design trials on the real target subject through a questionnaire. The following are the results of the recapitulation of the expert's validation of the media (table 3).

No	Expert	Aspects of assessment	Percentage	Criteria
1	Material expert	Learning	88%	Very good
		Contents	92%	Very good
2	Media expert	Appearance	74%	Well
		Programming	70%	Well
Overall average			81%	Well

Table 3 . Recapitulation of Validation Results

The material assessment was carried out by Ms. KA as the fourth grade teacher at SD Negeri 131 Pekanbaru. The results obtained from the material experts show that from the aspect of learning and the content of technology-based number calendar media, it is very good and feasible to use. The media assessment was carried out by Ms. JAA as a lecturer in the PGSD study program at the Riau University. In Table 4 it can be seen that the percentage results from the assessment of media experts received a good rating. However, after being reviewed by the experts, there were some criticisms and suggestions so that the media could be further refined (table 4) .

Validator	Revision
Material expert	The presentation of examples contained in the number calendar media is still difficult to understand. Presentation of the exercise is still less attractive.
Media expert	<i>icon</i> hint yet. The story display or introductory story on the number calendar menu is too long. Instructions for working on a number calendar are made even more practical.

Table 4 . Expert Review

After obtaining the results of an expert study of technology-based number calendar media on prime numbers in elementary schools, the input provided can be used to make improvements. Table 5 presents the results of media repair.






Revised Results	Information
	<p>Change the display of examples of numbers using pictures.</p>
	<p>The sample display has been changed to be more interactive than before.</p>
	<p>Addition of a slide that contains the function of the buttons that become navigation in the media.</p>
	<p>Summarize the introductory story to be shorter, denser, and clearer.</p>
	<p>The step instructions on the number calendar have been changed to be even more interactive than before.</p>

Table 5 . Media Revision Results of Technology-Based Number Calendar

Based on the results of the revision and input from these experts, the number calendar media can be tested on students. To see how students respond to the media, the researcher first tested the product for a small group trial of 3 fourth grade students and a field trial of 6 fourth grade elementary school students. The overall results of the questionnaires that have been filled out by students are summarized in table 6.

No	Questionnaire	Aspects of assessment	Percentage	Criteria
1	Small group trial	Appearance	84%	Very good
		Theory	90%	Very good
		Benefits	84%	Very good
2	Field trial	Appearance	88%	Very good
		Theory	86%	Very good
		Benefits	96%	Very good
Total			88%	Very good

Table 6. Recapitulation of Student Responses

As described above, the user's response to the developed media received a very positive response with a total response of 88% in the good category. The *dissemination stage*, at this stage the researcher has revised the product in accordance with the advice of experts and the results of product trials to students in the previous stage. The last stage of the distribution is to carry out packaging and *adoption* of a limited number calendar media. The number calendar media packaging is divided into two forms of presentation, first, it is presented using projector media in schools so that during learning the teacher can use number calendar media to support a more interesting learning process. Second, it is also packaged in the form of an Android application that can be downloaded by students. That way the media can be adopted or used properly in classroom learning at school also when students study at home.

Discussion

The research, entitled the development of technology-based number calendar learning media on prime number material, aims to produce learning media that can

support mathematics learning more effectively towards learning objectives. Appropriate learning media must be in accordance with the material and objectives to be achieved, this is in accordance with the statement Nurzayyana et al. (2021) that a media used must be adapted to the content or learning material and the objectives to be achieved.

The material taken is adjusted to the syllabus and the demands of the core competencies and basic competencies of class IV in odd semesters. To achieve this goal, this technology-based number calendar media was developed with a 4D design consisting of several stages, *namely defining, designing, developing, and disseminating*.

For whether or not the media that has been developed is obtained from the validation results that have been given by experts and media users. In developing media, learning eligibility criteria are needed, such as: (1) practical qualities that are seen in the ease of delivering material using media, being able to obtain or access media, easy to carry and easy to manage. (2) technical feasibility is the ability of media related to media. the quality of the media, the effectiveness factor, and the systematic arrangement of the media. (3) the feasibility of the cost of the media which lies in the effectiveness and efficiency of the media developed using cost-effective methods (Suwandi et al., 2021). The technology-based number calendar media on the developed prime number material has met the eligibility criteria according to the BSNP both in the assessment of material, media, and student assessment.

The results of the material expert validation consist of 10 assessment items which are divided into 5 assessment items on the learning aspect and 5 assessment items on the material content aspect. The results obtained from the material experts show that from the aspect of learning and the content of technology-based number calendar media, it is very good and feasible to use. As for the media assessment, it can be seen that the percentage results from the assessment get a good rating category, in the display aspect with a total assessment of 12 points and the programming aspect of 2 assessment points it can be concluded that the technology-based number calendar media is good and feasible to use. So that the overall average

result of expert validation is 81% with Good criteria. In conclusion, technology-based number calendar media on prime number material in elementary schools is feasible to use.

The feasibility of the developed media also needs to be seen from the user's response, namely students in elementary school. In the research that has been done, to see how students respond to the media, researchers first tested the product for a small group trial of 3 fourth grade students and a field trial of 6 fourth grade elementary school students. From the results of the small group test questionnaire on very good media, this assessment was obtained from 12 statement items which included the display aspect, 6 statement items, 3 assessment items for the material aspect and 3 statements for the usefulness aspect. The same thing was also tested on the field trial group which was carried out on 6 students using the same assessment aspects as the previous group, it was seen that the user's response was very good to the number calendar media.

According to Suyanto (in Saski & Sudarwanto, 2021) the computer research and publishing institute (CTR) argues that humans from what they hear are able to remember 30%, 20% of what they see, but 50% of hearing and sight, and 30% of the learning process. By utilizing technology-based number calendar media, it is hoped that students can absorb learning material more optimally because the media created is very supportive both in terms of hearing, sight and learning.

As described above, the user's response to the developed media received a very positive response with a total response of 88% in the good category. Based on the criteria attached to the previous table 1, the technology-based number calendar learning media that was developed if it got a percentage result of 68% was declared good and feasible to use with strong criteria.

CONCLUSION

Based on the results of research that has been carried out with the aim of developing technology-based number calendar learning media that can be used in prime number material in elementary schools, it can be concluded that the development of technology-based number calendar learning media on prime

number material in elementary schools, especially class IV uses the model *4D* development, namely *Define, Design, Develop, and Desseminasi*. At the desseminasi stage in this research, it was limited.

The feasibility of technology-based number calendar media on prime number material in elementary schools based on the assessment of material experts gets a percentage of 90% with the "Very good" category. Based on the assessment of media experts for display and programming on technology-based number calendar media on prime number material in elementary schools, the final result of the assessment was 74% with the "Good" category. Based on the results of expert assessments, the development of technology-based number calendar media on prime number material in elementary schools is worthy of being used as a medium for learning mathematics in fourth grade elementary schools.

The results of student responses to technology-based number calendar learning media on prime number material at SD Negeri 11 Pekanbaru are as follows: assessment of small group trial results 86.6% in the "Very good" category and 90.4% field trial results assessment with the category "Very good". Based on the results of the assessment, it can be concluded that the technology-based number calendar media can be used very well by students so that the product is declared feasible. Suggestions that can be put forward by researchers regarding development research are as follows: (1) Suggestions for teachers, teachers should be able to use technology-based prime number calendar learning media when learning mathematics on prime numbers at school. (2) Suggestions for students, students should have and use technology-based number calendar media for studying at home in order to increase knowledge and motivation in learning. (3) Suggestions for future research, it is better if the material used can be developed more broadly, not just on one subject matter, display and programming can be further improved and testing can be carried out in several schools in order to get input in developing better media.

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