



Development of Math Learning Media: Math Fraction App in Elementary School

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ABSTRACT

This study aims to develop innovative learning media, namely a digital math fraction app. The research method used is Research and Development (R&D) with the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) development model. The subjects in this study are fourth-grade students at Muhammadiyah Sugio Lamongan Elementary School. This study utilized expert media and content validation sheets, along with student response questionnaires and student activity questionnaires. The results of this study indicate: (1) the content expert validation of the math fraction app achieved an average score of 3.94, deemed highly valid, and the media expert validation achieved an average score of 3.91, also deemed highly valid. (2) The student response questionnaire scored 3.81, categorized as very good, and the student activity questionnaire had an average total score of 3.8, also categorized as very good. Based on the above findings, it is concluded that the Math fraction app is valid for use in mathematics education. So that it has an impact on student motivation, student attention, as well as student focus on learning.

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1. INTRODUCTION

To improve the quality of education, ideally, a teacher should have the ability to use technology effectively to achieve the expected learning objectives.(Indartiwi et al., 2020). In the era of Society 5.0, technology utilization is a crucial aspect that supports teachers in developing innovative learning strategies. One form of such utilization is the use of digital-based learning media. Smartphone devices are one of the potential media to be used optimally in the learning process, considering that they are practical, easily accessible, and commonly used among the community. The use of digital learning media has been proven to increase students' motivation, enthusiasm, and interest in participating in learning activities in a more active and fun way (Rosiana et al., 2023). Therefore, there is a need for adjustment and adaptation in the use of technology in the field of education so that the learning process becomes more effective and efficient.

The development of technology in the field of education today makes learning media play an important role in learning activities in the current Merdeka curriculum (Susandi et al., 2025). The support of various advanced information and communication technology devices has strengthened this view. Learning media can be interpreted as a tool that conveys information or learning materials, which aims to support teaching and learning activities (Kinanti et al., 2024). The utilization of learning media not only functions as a tool in delivering material, but can also function as a source for learning (Pagarra & Syawaludin, 2022). Therefore, the use of learning media that is suitable for the situation, conditions, and characteristics of students will be very beneficial in the teaching and learning process to achieve the desired educational goals (Juhaeni et al., 2023). According to Turnip & Karyono (2021) the development of learning materials in various forms, including in digital format, aims to support the learning process independently and make it easier for students to understand the content presented. The utilization of digital media in learning has proven to make a positive contribution, including increasing learning motivation, fostering interest in subjects, encouraging active student involvement, and developing thinking skills. In today's digital era, learning requires media that is aligned with the needs of learners, the environmental context, and their stage of development. Therefore, the development of digital learning media is a must to meet the demands of learning at the elementary school level (Huda et al., 2025). Thus, innovative efforts in presenting learning media, both in digital and printed formats, need to be continuously developed so that the media used becomes more interesting and relevant to the needs of students. This is expected to support the improvement of students' understanding of the material learned during the learning process.

Digital learning is a form of learning activity conducted through computer networks, either using the internet or intranet. With internet access, the learning process is no longer entirely dependent on the role of educators, as various information and learning resources are widely available and easily accessible. This allows learners to carry out learning flexibly, anytime and anywhere (Tholkhah et al., 2022). Therefore, digital media in elementary schools has an important role in the age of technology, because it can provide encouragement, convey information, and provide instructions to students in understanding learning materials (Kusumadewi et al., 2022). In the learning process, especially in mathematics, it is necessary to use the right tools to support the improvement of students' analytical skills. One form of effective tool is digital media, because it is able to present learning in a more interesting way through audio-visual displays, sound, video, and material that is relevant to the topic of the lesson. This media is designed to facilitate students' understanding of the material, so that it

can support a more efficient and effective learning process (Nursyahira et al., 2024).

Fractions are one of the important materials in learning mathematics that must be mastered by students at the elementary school level. The concept of fractions is a fundamental part of mathematics that plays a role in helping students understand the meaning of parts of a whole, as well as strengthening their ability to perform arithmetic operations. A good understanding of fractions allows students to solve various problems related to the topic more precisely and logically. According to Farokhah et al., (2025) The utilization of technology in the field of education plays an important role in helping students understand mathematical concepts, including fraction material. One of the media that can be used in the math learning process is the Math Fraction App. This media is a form of utilization of information and communication technology developed in the form of Android or smartphone-based applications. This application contains various important components, such as learning outcomes, learning objectives, instructions for use, teaching materials, and evaluation in the form of questions designed to train and improve students' critical thinking skills. This media development was conducted using Smart App Creator, a platform that allows the creation of interactive digital applications without the need for programming skills. This makes it easy for users, especially educators, to create multimedia learning materials that are interesting, interactive, and rich in content, and can be accessed through Android devices (Suhartati, 2021).

Mobile-based learning applications created with Smart app creator can be exported in HTML5 or .exe format, and this platform has also been used for various types of application development, such as mobile learning, mobile quiz, mobile tourism, company profile, to city promotion and branding media (Azizah, 2020). As a software, Smart App Creator offers various advantages. First, users do not need programming skills, so the app can be operated by anyone, including educators. Secondly, the resulting product can be run on various platforms, especially Android-based devices. Thirdly, the platform supports the addition of animations that can be customized according to the developer's needs. In addition, Smart App Creator allows the integration of various media formats, interactivity, and web-based storage and services. These features support the optimization of the functions of the developed application, making it an effective digital learning media that is responsive to user needs (Budyastomo, 2020). The use of learning media based on Smart app creator is expected to make students more interested, active, and involved in the learning process, and able to develop critical thinking skills.

The use of technology-based digital learning media plays an important role in the world of education because it functions as a means for teachers to convey material to students so that the learning process becomes more effective and enjoyable (Saradiva et al., 2023). Based on the results of interviews and observations conducted, there is a lack of use of learning media at SD Muhammadiyah Lamongan, so there is a need for learning media that can attract and motivate students towards learning (Rahmawati et al., 2024). In previous research by Puspita et al. (2023), with the title "Fraction Board Design to Stimulate the Elementary School Students' Critical Thinking Ability Regarding Fraction", it was found that validation by experts showed that this media was very valid, with an average percentage of 88.33%. This media is safe and attractive for use by elementary school students, and has a positive impact on improving students' critical thinking skills. In order to help students learn more easily, it is necessary to use digital-based visual learning media in grade IV, especially on material that is considered difficult by students. As a solution, a digital-based learning media called Math Fraction App was developed for math subjects with the topic of fractions in grade IV SD Muhammadiyah Sugio. The novelty of this research lies in integrating fraction concepts into

contextually designed interactive digital media, tailored to the characteristics and needs of elementary school students. The Math Fraction App media developed contains fraction materials with the same denominator, accompanied by interesting learning animations and a game-based learning approach, which until now has rarely been applied in fraction learning media. Therefore, this research provides a new contribution in the development of digital learning media that is adaptive, fun, and able to increase the effectiveness of mathematics learning at the elementary school level.

The method in this study, using the development method used in this study, is research and development (R&D), also known as “research and development”, which is a research method used to make certain products and test their effectiveness (Sugiyono, 2021). So this research is expected to develop digital learning media and to test the validity and practicality of the media.

2. METHODS

The development method used in this research is Research and Development (R&D) or known as research and development (R&D). The focus of this research is development that refers to the ADDIE model with 20 fourth-grade students of SD Muhammadiyah Sugio Lamongan as research subjects. This study was conducted in the even semester of 2024/2025 in grade IV mathematics subjects. 10 students were involved in the small group trial, and 20 students were involved in the large group trial. This research was conducted using material expert and media expert validation sheets, as well as student response and activity questionnaires.

Table 1. Research Instruments

Aspects assessed	Instrument	Respondent
Validity	Validity Sheet	Material Expert and Media Expert
Practicality	Student Response Questionnaire and Student Activity	Class IV Students and Observers

In this data collection method, there are three components used: expert validation, student response questionnaire, and student activity questionnaire. Material experts and media experts conduct expert validation to evaluate the validity of the learning media through validation sheets. The student response questionnaire collects data on students' responses to the learning media, while the student activity questionnaire measures how engaged students are in the learning process. The data collected through these methods provides an overall picture of the validity of the math fraction app media and how they can improve learning effectiveness.

3. RESULTS AND DISCUSSION

This section presents the results of research on the development of math fraction app media for grade IV students in mathematics subjects in elementary schools. This research was conducted at SD Muhammadiyah Sugio Lamongan.

The analysis stage begins with identifying needs and problems in the learning process. The aim is to obtain information related to the obstacles faced in teaching and learning activities.

This information is obtained through direct observation of learning activities carried out by class IV teachers. Based on the observation, it is known that digital learning media has not been applied, and the lecture method is still used, which causes students to be less interested in learning. This is because learning is dominated by text, so students feel bored and are not able to maximise in understanding of the material. Furthermore, an analysis of important elements in learning is carried out, such as curriculum, learning objectives, learning outcomes, and teaching materials contained in mathematics subjects in the material "Fractions" for grade IV. These elements will be the basis for developing the learning process. In addition, the analysis was also conducted to determine the characteristics of grade IV students of Muhammadiyah Sugio, Lamongan, namely: 1) on average, 10 years old; and 2) have an interest in interactive and fun learning.

In the design stage, the researcher developed a draft of learning media equipped with icons and various menu options that students can access online. The menu includes learning outcomes, learning objectives, instructions for using the media, learning materials, and evaluation in the form of questions. The researcher also compiled the components of the math fraction app learning media, which included materials, images, background music, practice questions, and assessments. In addition, researchers compiled validation sheets that would be used by validators, namely, material experts and media experts, to evaluate the products that had been developed. The researcher also prepared a response questionnaire and student activity questionnaire, which were used to find out the responses and the level of student involvement after using the math fraction app learning media.

At the development stage, researchers carry out the process of making a learning media math fraction app on mathematics subjects with fractions with the same denominator in class IV elementary school students. The following are the results of the development of the math fraction app media.

a. The main display of the math fraction app media

The display that appears when opening the math fraction app media is the cover or main display of the math fraction app media, where, on that display, students can start using the media. Furthermore, students are asked to press the start button to enter the menu display of the media math fraction app, as shown in **Figure 1**.



Figure 1. Main View of Math Fraction App Media

b. Menu display of math fraction app media

The next display on the math fraction app media is the menu display, where students can see several options, namely CP, TP, ATP, instructions for use, materials, and games. In this display, students are given several choices to start the stages that will be carried out. The following is the menu display in **Figure 2**.



Figure 2. Menu Display of Math Fraction App Media

c. Display CP, TP, ATP media math fraction app

On this display is a display that contains learning outcomes, learning objectives, and flow of learning objectives related to fraction material with the same denominator, with the aim of being able to direct and facilitate the learning process to be more structured, measurable, and oriented to the development of overall student competence. So that students can know the learning objectives to be learned, as shown in **Figure 3**, as follows.

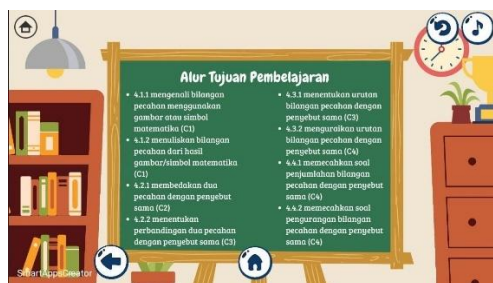


Figure 3. View CP, TP, ATP Media Math Fraction App

d. Display of instructions for using the math fraction app media

The next display is about the instructions for using the math fraction app media that can help students use the media. Namely, with various icons, students can find out the instructions for using the math fraction app media. Here are the instructions for use in **Figure 4**.



Figure 4. Display of Instructions for Using the Math Fraction App Media

e. Display of media material math fraction app

This display contains material on fractions with the same denominator, namely recognising fractions with the same denominator, comparing and sorting fractions with the same denominator, and calculating operations for addition and subtraction of fractions with the same denominator. In this material, students can learn material related to fractions with the same denominator. The material displayed on the media math fraction app in **Figure 5** is as follows:

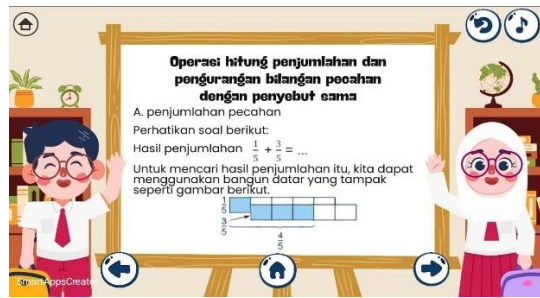


Figure 5. Display of media material math fraction app

f. Fraction math game app view

The last display on the media math fraction app is a game with story problems totaling 5 questions, and there is a score at the end of the problem. At the question stage, students can evaluate the results of the learning that has been done with the score display at the end of the work. The game is displayed on the Media Math fraction app as shown in **Figure 6**.

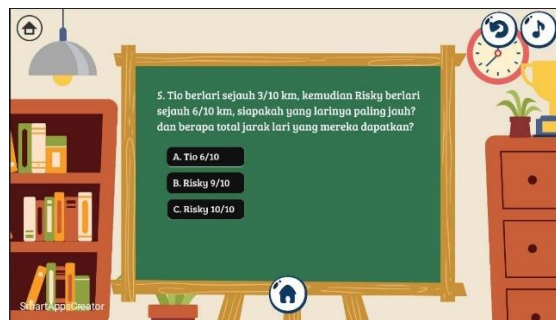


Figure 6. Fraction math game app view

In the implementation stage, the learning stage using the math fraction app media for fourth-grade students of SD Muhammadiyah Lamongan, with a total of 20 students. Then, at the final stage of evaluation, namely the stage of obtaining data where the data results in the validity and practicality of the math fraction app media for learning mathematics. The following are the results of the validity and practicality of the math fraction app medi. Results of Media Validity of Math fraction app.

a. Math fraction app Media Validation Results

Validation of the math fraction app media is a crucial step in the media development process, where several experts are involved to evaluate and assess the level of validity and quality of the media that has been made. This stage aims to obtain feedback to ensure that the learning media developed meet the eligibility standards, both in terms of material, appearance, ease of understanding, and ease of use by students. Therefore, the validation process not only serves to assess the quality of the media but also becomes an important step in improving and perfecting digital learning media to make it more innovative and effective in the learning process. Useful feedback to improve media quality and assess the extent to which the media meets predetermined standards. The following are the results of the validation that has been carried out by experts:

1) Material Expert Validation Results

Table 2. Material Expert Validation Results

Assessment aspect	Expert score		Total average	Category
	1	2		
Material	4.00	4.00	4.00	Very valid
Presentation techniques	3.83	3.83	3.83	Very valid
Language	4.00	4.00	4.00	Very valid
Total average			3.94	Very valid

Based on **Table 2** shows the results of validation conducted by material experts on the three aspects of the assessment, the math fraction app media obtained an average score of 3.94 from a maximum score of 4.00. The assessment given by two material experts shows that the math fraction app media is in a very valid category and is suitable for use as learning media.

2) Media Expert Validation Results

Table 2. Media Expert Validation Results

Assessment aspect	Expert score		Total average	Category
	1	2		
Media Suitability	4.00	4.00	4.00	Very valid
Effectiveness	4.00	4.00	4.00	Very valid
Ease of Use	4.00	4.00	4.00	Very valid
Attractiveness	3.67	3.67	3.67	Very valid
Total average			3.91	Very valid

Based on **Table 3** shows the results of validation conducted by media experts on the four aspects of the assessment, the math fraction app media obtained an average score of 3.91 from a maximum score of 4.00. The assessment given by two media experts shows that the math fraction app is in a very valid category and is suitable for use as learning media.

Practicality Results of Math fraction app Media

a. Small Group Trial Results (Trial 1)

The small group trial (trial 1) was conducted to assess the practicality of the math fraction app learning media. Data were collected through two instruments: the student response questionnaire and the student activity questionnaire. The student response questionnaire was filled in independently by students after the learning was completed, while the student activity questionnaire was filled in by observers or peers who observed student activities during the learning process.

1) Results of Student Response Questionnaire

Based on the data obtained from the small group trial (trial 1), a total average score of 3.75 out of a maximum score of 4.00 was obtained. The score shows that students' response to the learning media math fraction app is in the very good category. This indicates that the media is very effective and well-received by students during the learning process.

2) Results of Student Activity Questionnaire

At the small group trial stage (trial 1), observations were made of student activities to collect data on the level of student participation and involvement in various learning activities. Based on the data obtained from the small group trial (trial 1), a total average score of 3.5 out of a maximum score of 4.00 was obtained. This score indicates that students' responses to the math fraction app learning media are in the very good category. This indicates that the media is effective and well-received by students during the learning process.

b. Large Group Trial Results (Trial 2)

The large group trial (trial 2) was a continuation of the previous trial conducted in a larger class. The purpose of this trial was to explore the results of the limited trial and expand the scope of data by involving more students. During the large group trial, data were collected through student response questionnaires and student activity questionnaires. Student response questionnaires were filled out by students independently after the learning was completed, while student activity questionnaires were filled out by observers or peers who observed student activities during the learning process.

1) Results of Student Response Questionnaire

Based on the data obtained, it shows that the acquisition of a total average score of 3.81 from a maximum score of 4.00, where the value indicates that the student's response to the media math fraction app is in the very good category.

2) Results of Student Activity Questionnaire

Based on the data obtained from the large group trial (trial 2), a total average score of 3.8 out of a maximum score of 4.00 was obtained. This value shows that students' responses to the math fraction app learning media are in the very good category. This indicates that the media is very effective and well-received by students during the learning process. In addition, the results of the two trials showed a difference in total scores between the small group trial (trial 1) and the large group trial (trial 2).

This research develops an Android application-based learning media called the Math Fraction App. The app is designed using Smart App Creator (SAC), a platform that allows the creation of apps without the need for in-depth programming skills. Smart apps creator is a software that can be used to create mobile, desktop, and website-based multimedia features. SAC is also a desktop application that can be used to create Android and IOS mobile applications without programming code and can produce HTML, exe, and APK formats, making it easier for students to open learning resources on their smartphones (Helly et al., 2022). The development process follows the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), which consists of five main stages: needs analysis, media design,

application development, classroom implementation, and evaluation of the effectiveness of media use. The development and implementation of a math fraction app based on the smart apps creator (SAC) is a very appropriate strategic step to improve the quality of learning in this digital era. This app not only provides interesting and interactive learning media, but also allows students to learn independently anytime and anywhere, by 21st-century learning principles that emphasise flexibility and accessibility.

The validity of the math fraction app media can be evaluated through a series of validation tests that have been carried out previously. Based on the results of validation testing, which includes material and media elements, the math fraction app is declared very valid for use. This can be seen from the scores given by the experts, where the material expert gave a score of 3.94 with a very valid category, the media expert gave a score of 3.91 also in the very valid category. From this, it can be concluded that overall, the validity of the math fraction app media is included in the very valid category. After testing the validity of the material and media aspects, it can be concluded that the math fraction app media is very valid as a learning tool for math subjects about fractions with the same denominator for fourth-grade elementary school students. This is in line with the study conducted by Firdaus et al., (2024) which shows that the use of digital learning media supported by smart app creators is very feasible to be applied in learning mathematics in elementary schools. In addition, research conducted by Hussein et al., (2022) also stated that digital-based learning media is a valid medium used to assist understanding in learning.

The level of practicality of using the Math fraction app media can be known through the results of small group (trial 1) and large group (trial 2) trials. The purpose of this test is to find out students' responses and their activities during the learning process using the media. In the small group trial, the average student response to the use of the Math fraction app obtained a score of 3.75, which was included in the very good category. While the average score of student activities during learning using this media was 3.50, which was also classified as very good. Meanwhile, in the large group trial, the average student response to the media reached a score of 3.81, and the average student activity score was 3.80; both were in the very good category.

Based on these results, it can be concluded that learning using the Math fraction app is considered very valid, practical, and able to help students in understanding fraction material with the same denominator. This finding is in line with research conducted by Sirait et al., (2024) which states that interactive learning media is easy to use in the learning process, and that Smart app creator-based media is proven to be practical and effective in supporting learning. As a follow-up to the use of Math Fraction App media in learning mathematics material of fractions with the same denominator in grade IV elementary school students, it is recommended that this media can continue to be used and developed further. This media is proven to help improve students' understanding of the concept of fractions through an interactive and visual approach. In addition, teachers are expected to integrate the use of this application in a planned manner in the learning process in order to increase students' learning motivation and learning outcomes. Further research can also be conducted to evaluate the

effectiveness of this application in fraction materials with higher difficulty levels or at different grade levels.

4. CONCLUSION

The development of a learning media Math fraction app based on Android applications through the Smart app creator (SAC) platform is a strategic innovation in supporting the learning process of mathematics in the digital era, especially fraction material with the same denominator for grade IV elementary school students. This application is designed without the need for programming skills, but is able to produce interactive media in various formats (HTML, .exe, and .apk), which support flexible and independent learning by the demands of 21st-century learning.

The development process follows the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The results of validation by experts show that the Math fraction app is classified as very valid, both from the material aspect (with a score of 3.94) and the media aspect, with a score of 3.91. Furthermore, based on the results of small and large group trials, this app also proved to be very practical, with the average score of student responses and activities in the excellent category. Thus, it can be concluded that the Math fraction app is a valid, practical, and effective learning medium in improving students' understanding of fraction materials. These results also strengthen previous findings that digital-based interactive media, especially those developed through Smart app creator, are able to support a more interesting, efficient learning process, and in accordance with the needs of today's students.

5. AUTHORS' NOTE

This article is based on research conducted at SD Muhammadiyah Sugio Lamongan, serving as a contribution to the development of math learning media for elementary school students. The authors would like to express their sincere appreciation for the valuable guidance and support provided during the observation and interview process. Gratitude is also extended to the students, whose active participation and insightful contributions were invaluable to the completion of this study on developing the Math Fraction App as a learning medium in mathematics. The authors also declare that this article is free from plagiarism.

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