Interactive Multimedia Based on Contextual Approach in Mathematics Subjects for Fourth Grade of Elementary Schools

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A B S T R A K

Matematika merupakan salah satu mata pelajaran yang sering dijumpai dan mempunyai peran penting dalam kehidupan sehari-hari. Pelajaran matematika akan selalu ditemukan pada setiap jenjang pendidikan, baik pada sekolah dasar maupun di perguruan tinggi. Penelitian pengembangan ini dilatarbelakangi atas permasalahan berupa kurangnya media pembelajaran yang dapat meningkatkan minat dan motivasi siswa dalam kegiatan pembelajaran. Penelitian ini memiliki tujuan menganalisis efektivitas multimedia interaktif berbasis pendekatan kontesktual pada mata pelajaran matematika kelas IV SD. Penelitian pengembangan ini menggunakan model pengembangan ADDIE (Analyze, Design, Development, Implementation, Evaluation). Subjek penelitian ini ialah 3 orang ahli dan 32 orang siswa kelas IV SD. Metode pengumpulan data yang digunakan yaitu observasi, wawancara, angket, dan tes. Instrumen pengumpulan data menggunalan lembar kuisioner dan tes pilihan ganda. Teknik analisis data dalam penelitian ini ialah analisis deskriptif kualitatif, analisis deskriptif kuantitatif, analisis statistik deskriptif, analisis deskriptif inferensial. Hasil penelitian memperoleh hasil H0 ditolak dan Ha diterima. Dengan demikian maka dapat disimpulkan bahwa multimedia interaktif berbasis pendekatan kontekstual layak dan efektif digunakan pada mata pelajaran matematika materi pecahan senilai bagi siswa kelas IV di SD. Implikasi penelitian ini diharapkan membantu guru dalam memberikan pembelajaran matematika yang menyenangkan dan mudah dimengerti siswa.

A B S T R A C T

Mathematics is one of the subjects that is often encountered and has an important role in everyday life. Mathematics lessons will always be found at every level of education, both in elementary school and in college. This development research was motivated by the problem of a lack of learning media that could increase students' interest and motivation in learning activities. This research aims to analyze the effectiveness of interactive multimedia based on a contextual approach in fourth grade elementary school mathematics subjects. This development research uses the ADDIE (Analyze, Design, Development, Implementation, Evaluation) development model. The subjects of this research were 3 experts and 32 fourth grade elementary school students. The data collection methods used were observation, interviews, questionnaires and tests. Data collection instruments use questionnaires and multiplechoice tests. The data analysis techniques in this research are qualitative descriptive analysis, quantitative descriptive analysis, descriptive statistical analysis, inferential descriptive analysis. Based on the results of the t test, H0 is rejected and Ha is accepted. Thus, it can be concluded that interactive multimedia based on a contextual approach is feasible and effective for use in mathematics subjects with equal fraction material for fourth grade students in elementary school. The implications of this research are expected to help teachers provide mathematics learning that is fun and easy for students to understand.

1. INTRODUCTION

Mathematics is one of the subjects that is often encountered and has an important role in everyday life. Mathematics lessons will always be found at every level of education, both in elementary school and in college. Mathematics teaches students to have the ability to solve problems (Amalia et al., 2020; Anggraini et al., 2021.In line with this statement, mathematics which focuses more on the use of mathematical

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formulas in solving problems makes students feel that mathematical problems are difficult to understand (Arini & Agustika, 2021; Diyana et al., 2019). However, it cannot be denied that some students consider mathematics as a scary subject because it is difficult to complete. If this dislike of mathematics begins to appear early on, it will be difficult for students to understand mathematics at the next level Arisanti & Adnan, 2021; Sinaga et al., 2024). The same problem was also found in SD Negeri 8 Dauh Puri. Based on observations and initial interviews conducted with one of the fourth-grade teachers of SD Negeri 8 Dauh Puri, it can be concluded that some students still have difficulty understanding mathematical concepts. In students' minds, learning mathematics is considered difficult so that students' attitudes are formed that are not interested in learning mathematics. This is evident from the results of student learning in mathematics subjects which are quite low and some students are still below the KKTP standard of 70. There are 48% of students who have achieved KKTP, while 52% of students have not achieved KKTP. One of the materials that is considered difficult by students is the material on equivalent fractions because this material is one of the materials that requires students to think abstractly. The difficulty in understanding mathematical concepts is also caused by the lack of use of varied learning media so that it fails to attract students' interest in learning mathematics and students have difficulty understanding the material.

Learning media is a tool used as an intermediary in conveying information to students. The use of learning media can facilitate the delivery of information and increase students' absorption of learning materials, especially those that are abstract. The development of innovative and creative learning media will have an impact on increasing effectiveness and efficiency in the learning process (Geni et al., 2020; Jadidah et al., 2023). In learning, students tend to feel bored and fed up with the monotonous learning flow. With the help of learning media, the process of delivering material becomes impressive and enjoyable for students. Learning media can provide an attraction to students so that students' attention will be maintained in the learning process. This causes curiosity in students to increase, so that it can affect motivation and increase student interest. An educator who chooses the right learning media will affect the level of learning success and the achievement of learning objectives (Karmelia et al., 2021; Khoirunisa et al., 2023. Learning media that can be developed in various ways along with increasingly advanced technological developments.

The use of technology in learning activities, especially as a learning medium in the form of interactive multimedia, is expected to help attract students' interest and motivation in more varied learning activities. Interactive multimedia is one of the media that can be used in learning activities to facilitate the delivery of learning messages so that more effective learning is created (Diyana et al., 2019; Kusumawati et al., 2021). Interactive multimedia is designed to help students clarify difficult-to-understand material, where this media supports the teacher's explanation of the learning material by providing reinforcement in the form of interesting images, audio, video, and animation. Thus, it will create student motivation and interest in participating in learning activities so that it will have an impact on improving student learning outcomes (Anggraini et al., 2021; Diyana et al., 2019). Interactive multimedia is digital content from a computer program that can help deliver learning materials with a combination of images, text, audio, video, and integrated animation. This is in line with the opinion of other researchers that through a combination of images, text, audio, video, and animation, interactive multimedia will be created that is suitable for use in delivering abstract learning materials to be more concrete (Mansyur & Khaerani, 2020; Oktafiani et al., 2020).

The use of interactive multimedia should be adjusted to the selection of the right approach so that it will get maximum results in understanding a good mathematical fact and concept. One approach that can be used to support interactive multimedia is the contextual approach. The contextual approach is a learning concept that links the material being studied with the situation in the real life of students Muharam et al., 2023; Ngananti et al., 2023). This means that learning activities will be formed that invite students to situations in their daily lives, so that students are encouraged to connect the knowledge they have with applications in real life. This approach helps teachers in delivering learning materials because students more easily absorb materials presented with examples that can be found in everyday life Nurjakiyyah & Apriani, 2022; Pratiwi & Wiarta, 2021). The contextual approach emphasizes students to find and build their own knowledge so that they gain their own experience and knowledge by linking the material learned with real life.

Based on the problem explanation that has been explained, this study aims to analyze the effectiveness of Interactive Multimedia Based on Contextual Approach in Mathematics Subjects for Grade IV Elementary School. This study is expected to encourage teachers to utilize technology in the learning process to help deliver material by linking it to students' daily lives. The novelty of this study lies in the use of a contextual approach in interactive multimedia offering a more relevant learning experience for students by connecting the mathematical concepts taught with real situations they face every day. This facilitates deeper understanding through direct application.

2. METHOD

This type of research is development research. The research model used in this development research is the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The ADDIE model is a research development model that is designed in a programmed and systematic manner that can be used to help solve problems related to learning resources that are in accordance with the needs and characteristics of students (Ngussa, 2014). The learning media developed in this study must be tested for its feasibility level by conducting a product trial. Through this trial, it will be known whether or not the media developed is feasible if used in learning activities. The product trial is carried out in two stages, namely expert evaluation or expert review which will be carried out by learning content experts, instructional design experts, and learning media experts, a product trial will be carried out in 2 stages, namely individual trials and small group trials.

The subjects of this study were 32 fourth grade students. The data collection methods used were observation, questionnaires, interviews and tests. While the instruments used were observation sheets, questionnaires and multiple-choice tests. There are several grids of questionnaire instruments for interactive learning multimedia development research which can be seen in Table 1, Table 2, Table 3, Table 4, and Table 5.

Table 1. The Learning Content Expert Instrument Grid

No.	Aspect	Indicator
1.	Curriculum	1. The learning materials presented are in accordance with Learning Achievements 2. Learning materials according to learning indicators 3. The learning materials presented are in accordance with the learning objectives.
2.	Material	4. Accuracy of the learning material presented 5. The attractiveness of learning materials 6. Material according to student characteristics 7. Presentation of learning materials is supported by appropriate media 8. The material is easy to understand 9. The material presented contains important concepts that students need to know.
3.	Language	10. The language used is easy to understand and appropriate to the cognitive level of students.
4.	Evaluation	11. The evaluation given is in accordance with the learning material 12. The level of difficulty of the questions is adjusted to the students' cognitive abilities.

Table 2. The Instructional Design Expert Instrument Grid

No.	Aspect	Indicator
1.	Objective	1. The learning objectives presented are clear 2. Learning objectives according to the ABCD format
2.	Strategy	3. In its use, it provides logical steps and free navigation flow 4. Provide examples for conceptual understanding 5. Delivery of material can provide learning motivation to students 6. Able to attract students' attention 7. Provides clear learning step-by-step instructions 8. Provide students with opportunities for independent learning
3	Evaluation	9. The questions presented are in accordance with learning outcomes and indicators. 10. The questions presented vary

Table 3. The Learning Media Expert Instrument Grid

No.	Aspect		Indicator
1.	Technical	1.	Learning media is easy for students to use
		2.	Media can help students understand learning materials
2.	Text	3.	Suitability of font type, font size, and spacing used
		4.	Text readability
		5.	The narrative used in the media is appropriate
3	Picture	6.	The images presented can support learning
		7.	Images in the media help students understand the material
4	Audio	8.	Media uses appropriate sound effects
		9.	Media supported with appropriate music
5	Video	10.	Learning videos in interactive multimedia can support understanding of the material.
		11.	The learning videos presented are interesting
6	Animation	12.	Media is supported with appropriate animation
		13.	The animation presented is interesting for students
7	Color	14.	The colors used have the right and harmonious composition and combination.
8	Appearance	15.	The screen display on the media looks harmonious and balanced.
		16.	The quality of media display can attract students' interest in learning.

Table 4. The Individual Test and Small Group Test Instrument Grid

No.	Aspect		Indicator
1	Media	1.	The text presented in the media is easy to read and understand.
		2.	The images presented in the media can be seen clearly
		3.	The learning videos presented can help understand the material.
		4.	The audio used can be heard clearly
		5.	The attractiveness of the animation used
2	Material	6.	Using examples in the media can make it easier to understand the material.
		7.	The material presented is easy to understand
		8.	The material presented is in accordance with the material studied at school.
3	Strategy	9.	Media can attract students' attention
4	Evaluation	10.	Instructions for completing the questions are presented clearly.
		11.	Providing evaluation questions that are appropriate to the material being studied
5	Benefit	12.	Interactive learning multimedia makes the learning process easier

Table 5. The Effectiveness Test Grid

Competency Achievement		Indicator
Students recognize equivalent fractions using pictures and mathematical symbols.	1.	Recognize the shape of fractions using pictures
	2.	Demonstrate equivalent fractions using pictures and mathematical symbols
	3.	Determining the equivalent fraction of several fraction forms
	4.	Analyzing problems related to equivalent fractions

Instrument trials were conducted to determine the feasibility and quality of the research data collection tools. In this development research, testing of the test instrument was conducted through several stages, namely validity, reliability, difficulty, and test discrimination. Data analysis techniques used in this development research were qualitative descriptive analysis techniques, quantitative descriptive analysis techniques, descriptive statistical analysis techniques, and inferential statistical analysis techniques. Qualitative analysis techniques were conducted by grouping qualitative data in the form of interview results, media feasibility value criteria, comments, responses, criticisms, and suggestions for improvement. The results of the data analysis were then used to revise the developed product. Quantitative descriptive analysis was used to process data obtained through questionnaires in the form of scores. Inferential statistical analysis was used to assess the effectiveness of the developed product by analyzing the results of

the test instrument measurements after the use of interactive multimedia. Data were collected using a posttest to target group students. The results of the student posttest were analyzed using a one-tailed t-test (One Sample T-Test) to determine the effectiveness of interactive multimedia based on a contextual approach. Before testing the hypothesis, a prerequisite test was first carried out including a normality test.

3. RESULT AND DISCUSSION

Result

This research was conducted in grade IV in the odd semester at SD Negeri 8 Dauh Puri. The subjects in this study were 32 students of grade IV B. The development of interactive multimedia based on a contextual approach uses the ADDIE development model, which includes the analysis stage, design stage, development stage, implementation stage, and evaluation stage. The activities carried out by researchers at each stage of the research are:

The first stage, namely analysis (analyze), is the stage of analyzing learning needs, competencies, characteristics of students, and learning materials. Based on the analysis that has been carried out, the results of the information obtained are the lack of technology-based teaching materials used in the learning process, monotonous and less varied learning activities, and learning objectives on the material of equivalent fractions have not been achieved optimally. This is shown from the results of learning mathematics of several students who are still below the KKTP. The use of learning media in mathematics subjects is very rare compared to other subjects, so that it causes students to feel bored in learning mathematics. To overcome student problems, appropriate learning media are needed that are in accordance with student characteristics. Interactive multimedia is the right choice of media and is suitable for use by students. Various components of interactive multimedia consisting of audio, video, images, text, and animation can increase student learning motivation and facilitate the delivery of learning materials.

The second stage, namely design, is the stage of making designs related to the products being developed. At the design stage, the determination of hardware and software used in the development of interactive multimedia is carried out. The hardware used in the development of interactive multimedia is smartphones and laptops, while the software used is Smart Apps Creator 3, Canva, Capcut, and the Bitly site. At this stage, the design of interactive multimedia is carried out including the creation of flowcharts, storyboards, and flow diagrams as a guide for product development. Furthermore, the collection of materials needed in the development of interactive multimedia is also carried out, such as animations, icons, images, materials, and so on. In addition, the preparation of research instruments and the preparation of teaching modules are also carried out. The research instruments created are expert questionnaires and product trial questionnaires by students and product effectiveness test instruments.

The third stage, namely development, is the stage of realizing the product according to the specified design. In interactive multimedia, there are several main pages, namely the title page, the instruction page, the main media menu page that creates the learning achievement page, the material page, the learning video page, the educational game page, the evaluation page, and the developer profile page, and the exit page. Interactive multimedia is designed with various learning menu components so as to attract students' interest and motivation in learning activities. At the development stage, product testing is also carried out by experts, namely learning content experts, instructional design experts, and learning media experts. Product testing by experts aims to determine the feasibility of interactive multimedia products based on the assessments, suggestions, and input given by experts for further revision to perfect the development product. The results of the media that have been successfully developed can be seen in Figure 1.
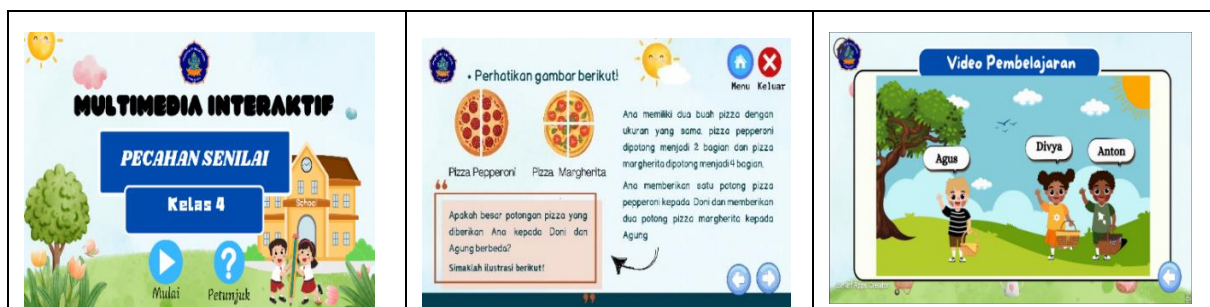

Figure 1. Interactive Multimedia Display

The fourth stage is implementation which is carried out to see the user response to the product development. After carrying out revisions based on expert assessments, the next step is to conduct a

product trial by students, namely individual trials and small group trials. The individual trial involved three students in grade IV B with different learning outcomes, consisting of one student with high learning outcomes, one student with moderate learning outcomes, and one student with low learning outcomes. Meanwhile, the small group trial involved nine students in grade IV B with different learning outcomes, consisting of three students with high learning outcomes, three students with moderate learning outcomes, and three students with low learning outcomes. At this stage, an interactive multimedia product effectiveness test was also carried out with a posttest only design involving grade IV B students of SD Negeri 8 Dauh Puri. Before giving the posttest questions, the implementation of interactive multimedia was carried out in classroom learning activities for one meeting. Furthermore, the posttest questions were given to students in the form of 20 multiple-choice questions. The results of the interactive multimedia feasibility analysis were obtained through assessments by experts, namely learning content experts, instructional design experts and learning media experts as well as product trials by students, namely individual trials and small group trials. The results of the feasibility analysis of interactive multimedia are presented in Table 6.

Table 6. Percentage of Results of Interactive Multimedia Trial

No	Test Subject	Results (%)	Information
1	Learning Content Expert	93.75%	Very good
2	Instructional Design Expert	97.5%	Very good
3	Learning Media Expert	98.43%	Very good
4	Individual Test	90.27%	Very good
5	Small Group Test	91.89%	Very good

Based on Table 6, the score obtained from the expert assessment and the product trial by students, the overall score was 94.36% with a very good or very feasible category. So, it can be concluded that the interactive multimedia development product based on a contextual approach is feasible to be used in student learning activities in mathematics subjects, fractional material, grade IV of elementary school. Interactive multimedia products that get a very feasible category still require revision based on suggestions and comments from experts in order to perfect interactive multimedia products.

The prerequisite test is a data test that must be carried out before the one-tailed t-test (One Sample T-Test) is carried out because to carry out the one-tailed t-test requires the data to be normally distributed. So, the requirements for the one-tailed t-test analysis are to conduct a data normality test. Based on the Shapiro Wilk Tables, the results obtained are that 0.933 for n = 32 is between p = 0.05 and p = 0.1. Then p> 0.05 so that it can be concluded that the posttest data is normally distributed. After the posttest data is declared normally distributed, a hypothetical test is carried out which aims to determine the accepted research hypothesis. In this study, the hypothesis test was carried out using the one-tailed t-test formula (One Sample T-Test) to determine the effectiveness of interactive multimedia based on a contextual approach in grade IV of elementary school. Based on the results of the t-test, the t-count value is 3.524, while the t-table value at a significance level of 5% (0.05), dk = n - 1 = 32 - 1 = 31, then for a one-sided test, the t-table value is 1.695. These results indicate that t-count > t-table so that H0 is rejected and Ha is accepted. It can be concluded that the average result of the students' post-test score is greater than the KKTP score. Thus, interactive multimedia based on a contextual approach is effectively applied to the mathematics subject of equivalent fractions for grade IV students at SD Negeri 8 Dauh Puri.

The fifth stage, namely evaluation, is the final stage of the ADDIE development model to determine the success of the development product. The evaluation carried out is a summative evaluation carried out by analyzing the results of the posttest that has been completed by students. Based on the results of the analysis carried out, the effectiveness of the product on student learning outcomes can be determined.

Discussion

In learning activities in elementary school, not a few students find it difficult to understand the material being taught, especially in mathematics. This is because students often consider mathematics to be scary and difficult to understand, so that students are less enthusiastic and do not focus on learning activities (Rahmadhani et al., 2022; Samsiyah & Fajar, 2021). Teachers as the ones in control of the learning process are required to be able to help students with difficulties in the learning process. One of them is that teachers need to be careful and skilled in choosing and applying learning media that are fun and interesting to students. Teachers also need to utilize technology to innovate in learning activities so that they can make it easier for students to understand learning materials and create meaningful learning that can be applied in students' daily lives (Rahmi & Samsudi, 2020; Robbia & Fuadi, 2020).

MediaLearning is a tool that can be used by teachers to facilitate the delivery of information in the form of concepts or materials in learning activities so that it can be conveyed to students in a concrete and

real way. The use of varied learning media that can interact directly with students will help attract students' interest in learning activities (Sudihartinih et al., 2021; Wulandari, 2020). Interactive multimedia is one of the learning media that can be used by teachers in learning activities, especially in fractional material. Interactive multimedia is a combination of text, audio, video, and animation that can provide a fun learning experience for students, so that clear information related to learning materials can be achieved Muharam et al., 2023; Nareswari et al., 2021). The contextual approach is an approach that is able to form a relationship between learning materials and students' daily lives so that learning becomes more meaningful and is firmly embedded in students' memories through seven main components of learning consisting of: constructivism, questioning, inquiry, learning community, modeling, reflection, and authentic assessment (Yudhistira & Widiarina, 2019; Zahwa & Syafi'i, 2022).

Interactive multimedia is a combination of audio, text, video, images and animations that form a single unit that allows users to interact, create and communicate with the media (Amalia et al., 2020; Yudhistira & Widiarina, 2019). Interactive multimedia can present learning materials more concretely with the help of text, audio, video, images, and animations so that it is expected to make it easier for students to understand learning materials. In its use, students can interact directly with learning media so that they can increase student motivation in the learning process. Multimedia is able to create interactivity between the media and its users because it is equipped with a control tool, so that users can operate the media according to their wishes (Sinaga et al., 2024; Wulandari, 2020). Based on this, it can be concluded that interactive multimedia based on a contextual approach is the development of a learning product in the form of interactive multimedia that combines several media components that allow users to interact directly and its application is supported by a contextual approach that can foster student motivation in connecting learning materials with everyday life situations so that learning becomes more meaningful.

The use of media in the learning process needs to be combined with the right approach. One of them is the contextual approach, which can help teachers relate learning materials to situations in students' daily lives so that students are encouraged to relate their knowledge to applications in real life Hardi & Rizal, 2020; Kusumawati et al., 2021). The contextual approach emphasizes students to find and build their own knowledge so that they gain their own experience and knowledge from linking the material learned with real life. So the contextual approach is one of the approaches that is suitable to be applied to grade IV elementary school students, especially on fraction material in mathematics subjects Kusumawati et al., 2021; Pratiwi & Wiarta, 2021). Therefore, the combination of interactive multimedia and contextual approaches is expected to provide a variety of fun learning media for students, and can improve the ability of fourth grade elementary school students in mastering equivalent fraction material.

Students stated that interactive multimedia is able to help facilitate understanding of learning materials and attract students' interest in learning because the components in interactive multimedia are varied, such as learning materials, learning videos, educational games, evaluations, and are equipped with animations and images that are interesting for students (Bosica et al., 2021; Diyana et al., 2019; Ngananti et al., 2023). This is in line with the opinion of other researchers that interactive multimedia contains various media components that combine audio and visual elements that are packaged attractively, so that they are able to stimulate students' attention in the learning process (Muharam et al., 2023; Samsiyah & Fajar, 2021). Several studies also examine the use of interactive multimedia in the learning process. Research states that interactive multimedia is feasible and effective for improving student learning outcomes, especially in simple fractions for grade III elementary school students (Khoirunisa et al., 2023). The development of multimedia-based fractional media shows that the interactive multimedia developed received a positive response of 96% from students who stated that they agreed with the application of interactive multimedia for mathematics lessons. This shows that interactive multimedia meets the criteria for being effective and suitable for use in solving problems related to mathematics subjects(Nurjakiyyah & Apriani, 2022).

Interactive multimedia based on contextual approach is effectively applied to mathematics subjects in grade IV of elementary school because in interactive multimedia there are various components, such as images, text, videos, animations that support the needs of students who have different learning styles. In interactive multimedia there are various menus that can be accessed by students, such as material menus, learning videos, educational games, and evaluations (Sudihartinih et al., 2021; Wulandari, 2020). This causes interactive multimedia to be able to facilitate students in learning and is able to concretize abstract material. In addition, in interactive multimedia there is direct interaction between students and media that allows students to independently control the learning activities they want. This is in line with the opinion that interactive multimedia contains two-way communication that allows users to operate it by choosing the desired activities, so that users have the freedom to interact and control interactive multimedia applications independently (Arini & Agustika, 2021; Jadidah et al., 2023).Interactive multimedia is presented digitally so that it can be used anytime and anywhere, either accompanied by a teacher or learning independently and can be accessed repeatedly by students. The use of interactive multimedia in

learning activities can be one solution in overcoming problems faced by students related to increasing student motivation and learning outcomes (Karmelia et al., 2021; Kusumawati et al., 2021). Therefore, the use of interactive multimedia is suitable to be applied in classroom learning activities.

Although this research has been running smoothly and the research objectives have been achieved. However, there are some limitations in this research. These limitations occur due to lack of time and researcher's ability. These limitations include, this interactive multimedia media only discusses the material of equivalent fractions in mathematics learning for elementary school students. This research only develops products in the form of interactive multimedia for grade IV elementary school students. Based on these limitations, it is expected that further researchers can conduct research with a wider scope of material and more research subjects.

The implication of this research is that interactive multimedia can provide opportunities for students to build their own understanding of learning materials because interactive multimedia can be used independently by students for learning purposes, so that it can increase student activity and interaction with learning media. Interactive multimedia is designed with various components that are interesting for students to use in the learning process. This will foster students' interest and motivation in learning, and can make it easier for students to understand abstract materials.

4. CONCLUSION

Based on the research conducted, it can be concluded that interactive multimedia based on a contextual approach is effectively applied to the mathematics subject of equivalent fractions for grade IV students at SD Negeri 8 Dauh Puri. Interactive multimedia can motivate teachers to improve their ability to create innovative, interesting teaching materials that are in line with current developments and can improve students' technological abilities through the use of digital-based learning media.

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