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Interactive Multimedia Based on a Contextual Approach to Material Changes in the form of Objects

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ABSTRAK

Penelitian pengembangan ini dilatarbelakangi oleh kurangnya hasil belajar IPA siswa V dikarenakan media pembelajaran yang kurang kreatif dan inovatif. Penelitian ini bertujuan untuk menghasilkan multimedia berbasis pendekatan kontekstual yang valid, praktis dan efektif untuk digunakan pada muatan IPA kelas V Sekolah Dasar. Penelitian ini tergolong kedalam jenis penelitian pengembangan yang dikembangkan dengan menggunakan model ADDIE. Subjek yang terlibat dalam penelitian ini yakni ahli materi, ahli desain pembelajaran, ahli media, serta siswa kelas V SD. Pengumpulan data dilakukan dengan menggunakan metode observasi, wawacara, serta angket. Instrument yang digunakan untuk mengumpulkan data pada penelitian pengembangan ini adalah instrument berupa lembar angket/kuesioner. Data yang diperoleh dalam penelitian kemudian dianalisis dengan teknik analisis deskriptif kualitatif, kuantitatif, dan statistic inferensial. Hasil analisis data menunjukkan bahwa diperoleh nilai $thitung$ = 8,35. Nilai $ttabel$ = 1,69 selanjutnya dibandingkan dengan taraf signifikansi 5% dengan ketentuan df = ($n1$ + $n2$) − 2 = (18 + 18) – 2 = 34. Hasil perhitungan menunjukkan bahwa $thitung$ > $ttabel$ = 8,35 > 1,69 dengan pengambilan keputusan. Bila thitung > ttabel, maka H0 ditolak dan H1 diterima. Berdasarkan hasil tersebut maka dapat disimpulkan bahwa multimedia interaktif berbasis pendekatan kontekstual layak dan efektif untuk diterapkan di kelas V SD.

ABSTRACT

This development research was motivated by the lack of student V learning outcomes in science due to less creative and innovative learning media. This study aims to produce multimedia based on a contextual approach that is valid, practical and effective for use in science content for class V Elementary Schools. This research belongs to the type of development research that was developed using the ADDIE model. The subjects involved in this study were material experts, instructional design experts, media experts, and fifth grade elementary school students. Data collection was carried out using the method of observation, interviews, and questionnaires. The instrument used to collect data in this development research is an instrument in the form of a questionnaire/questionnaire. The data obtained in the study were then analyzed using descriptive qualitative, quantitative and inferential statistical analysis techniques. The results of the data analysis showed that the value of$thitung$= 8.35 was obtained. The value of$ttabel$= 1.69 is then compared to a significance level of 5% with the condition that df = ($n1$+$n2$) − 2 = (18 + 18) – 2 = 34. The calculation results show that$thitung$>$t\ tabel$= 8.35 > 1.69 with decision making. If tcount > ttable, then H0 is rejected and H1 is accepted. Based on these results, it can be concluded that interactive multimedia based on a contextual approach is feasible and effective to be implemented in class V SD.

1. INTRODUCTION

Science is a subjectrelated to living things and nature or the environment (Anggreni et al., 2021; Surur et al., 2021).Science subjects provide students with an understanding of concepts and knowledge related to nature which are of course rational (reasonable) and objective (according to reality) (Wati et al., 2022; Wulandari et al., 2019). Implementing science learning can help students to develop their thinking abilities, both thinking critically and objectively (Wahab et al., 2021; Winangun, 2020).Science learning emphasizes process skills so that you have good mastery of the material (Wicaksono, 2020; Winangun, 2020).Apart from the important role of the environment in the science learning process, the existence of supporting tools in the form of learning media in classroom learning activities will also make it easier for

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students to understand science material. (Dwiqi et al., 2020; Yuliawati et al., 2022).The use of learning media in teaching and learning activities in class will of course also make it easier for teachers to convey material to students (Mawaddah et al., 2022; Salmah, 2019).Effective and efficient learning will also be created by utilizing learning media in learning activities.

In implementing the learning process, media can be used as an intermediary tool between teachers and students in understanding learning material to make it more effective and efficient (Lubis et al., 2019; Rahman, 2019).The use of learning media in teaching and learning activities can make it easier for students to understand the material being studied because it can increase students' interest, enthusiasm and motivation to learn. (Kasturi et al., 2022; Wulandari et al., 2019).It is further explained that learning media can play a role in helping improve students' cognitive (knowledge), affective (attitude) and psychomotor (skills) abilities. (Eliana et al., 2022; Sukarini & Manuaba, 2021).These three aspects are very important to develop and improve because they are the main goals in learning activities. Learning media can support the smooth implementation of the learning process, especially in science content.Basic science concepts are science materials that are relevant for elementary school children's understanding of concepts (Agustiana et al., 2020; Handayati, 2020).

However, the reality on the ground shows that the use of media in the science learning process is still relatively low (Anggreni et al., 2021; Dwiqi et al., 2020). This is also in line with the results of observations carried out at SD No. 5 Abiansemal. The results of observations and interviews show that in the science learning processStudents tend to be passive and have difficulty understanding the learning material presented by teachers who only rely on visual learning media in the form of pictures. The delivery of the material is also less connected to the real life experienced by students, so that students cannot understand the material well, especially in science learning. Results of interviews conducted with the homeroom teacher for class V at SD No. 5 Abiansemal informed that the learning resources used by teachers were theme books and worksheets. Based on interviews conducted with students, the results showed that students preferred learning using videos compared to pictures because they could listen to sounds, music, songs, and see moving pictures and read very interesting writing.

One of the media that can meet students' learning needs is interactive multimedia, this is because interactive multimedia is a tool equipped with control devices that can be operated by the user in selecting something they want. (Kurniawati & Nita, 2018; Nuraini et al., 2021). In a multimedia application, the user is given the ability to control existing elements, so that the multimedia is called interactive multimedia. (Hartono et al., 2018; Kurniawati & Nita, 2018).Interactive multimedia is a combination of several media designed in one whole, such as images, text, audio, animation and simulations which are used in learning to clarify abstract material or concepts into concrete ones equipped with tools .(Deliany et al., 2019; Supardi, 2020; Surur et al., 2021).This interactive multimedia can provide an interesting and effective learning atmosphere, so that students can actively participate in learning activities (Nugraha et al., 2019; Wahyu et al., 2020).The use of interactive multimedia will be more effective if accompanied by the application of a contextual or learning approach*contextual teaching and learning*(CTL).

The contextual approach or contextual teaching and learning (CTL) is a learning approach that can help teachers facilitate the implementation of learning by emphasizing the process of full student involvement to be able to find the material being studied and relate it to real life situations so as to encourage students to be able to apply it in life. them every day (Nanda et al., 2017; Sugandi & Bernard, 2018). The contextual approach emphasizes students' activeness in discovering knowledge related to learning material (Octavyanti & Wulandari, 2021; Rosyida, 2018). Applying a contextual approach in a learning process requires support from the use of varied media (Sari, 2022; Suharto, 2018). The use of varied media can be done using interactive multimedia, because multimedia combines text, art, sound, images and animation which are presented interactively. (Azzahra et al., 2022; Gading et al., 2019).

Several previous studies have revealed that interactive multimedia can display material efficiently, attract students' interest and improve students' ability to solve problems (Wedi & Nuraini, 2021). Other research results reveal that multimedia can make students learn actively with high motivation because of their interest in multimedia which is able to display tests, images, audio, animation and video. (Princess, 2018).The results of further research revealed that there was an increase in student learning outcomes after learning using interactive multimedia (Arisanti & Adnan, 2021). Based on several research results, it can be said that interactive multimedia is very suitable for use in helping students' learning process. It's just that in previous research, there have been no studies that specifically discuss the development of interactive multimedia based on a contextual approach to science learning. So this research focuses on this study with the aim of: produce multimedia based on a contextual approach that is valid, practical and effective for use in grade V elementary school science content.

2. METHOD

This research is classified as a type of development research which is carried out using the ADDIE development model. The ADDIE development model consists of five development stages, namely the Analyze, Design, Development, Implementation and Evaluation stages. The subjects involved in this research were: material experts, learning design experts, media experts, and fifth grade elementary school students.Meanwhile, the object of this development research is interactive multimedia based on a contextual approach.Data collection in this development research was obtained using the questionnaire distribution method. A questionnaire is a way of collecting data by giving a list of questions or statements to research subjects. In this case, the questionnaire is useful for obtaining information from research subjects regarding the validity and practicality of the interactive multimedia based on the contextual approach created. In this research, interview, observation and test methods were also used. The interview method in this development research is used to find out problems in the field experienced by teachers and students. The observation method in this development research was used to collect data for the purposes of conducting a practicality test of interactive multimedia based on the contextual approach being developed.

The instrument used to collect data in this development research is an instrument in the form of a questionnaire/questionnaire. The questionnaire used consists of various statements made based on the aspects to be assessed. In this study, a closed questionnaire was used, which is a questionnaire with available answer choices that respondents can later choose. Before the questionnaire is given to respondents, the questionnaire is first consulted with the supervisor to obtain input or suggestions in order to improve or perfect the questionnaire created. After the questionnaire has been approved by the supervisor, The questionnaire is then submitted to experts to assess its suitability so that the questionnaire that has been created can be said to be relevant or suitable for use in testing the validity and practicality of a product that has been developed, namely in the form of interactive multimedia based on a contextual approach. The data collection grid in interactive multimedia development research can be seen in Table 1, Table 2, and Table 3.

Table 1. Material Expert Instrument Grid

No.	Aspect	Indicator	Item Number	Number of Items
1.	Curriculum	Suitability of material with basic competencies.	1	3
		Conformity of material with indicators of competency achievement.	2	
		Suitability of material to learning objectives.	3	
2.	Material	Material truth.	4	9
		Material accuracy.	5	
		The importance of material.	6	
		Depth of material.	7	
		Material attractiveness.	8	
		Suitability of material to student characteristics.	9	
		The material is easy to understand.	10	
		The material represents real life.	11	
		The concept of matter can be logically explained clearly.	12	
3.	Grammar	Use of appropriate and consistent language.	13	3
		The language used is easy to understand.	14	
		The language used is appropriate to the characteristics of the students.	15	
Amount				**15**

Table 2. Learning Design Expert Instrument Grid

No.	Aspect	Indicator	Item Number	Number of Items
1.	Objective	Suitability of learning objectives.	1,2	4
		Consistency of objectives, materials, and evaluation.	3,4	
2.	Strategy	Systematic delivery of material.	5	5

No.	Aspect	Indicator	Item Number	Number of Items
		Learning activities can motivate students.	6	
		Provide students with opportunities for independent learning.	7	
		The explanation of the material is interesting and appropriate to the characteristics of the students.	8.9	
3.	Evaluation	Provide evaluation questions to test student understanding.	10	4
		The questions presented are in accordance with the indicators and learning objectives.	11,12	
		Clarity of instructions for working on questions.	13	
		Amount		**13**

Table 3. Media Expert Instrument Grid

No.	Aspect	Indicator	Item Number	Number of Items
1.	Technical	Ease of using media.	1	3
		Media can help students understand the material.	2	
		Media can arouse student motivation.	3	
2.	Appearance	Attractive appearance (colors, background and animation).	4	2
		The screen display is harmonious and balanced.	5	
3.	Text	Accurate use of typeface.	6	3
		Accurate use of font size.	7	
		Accurate use of text spacing.	8	
4.	Picture	The use of images in interactive multimedia supports learning.	9	2
		The use of images supports understanding of the material.	10	
5.	Audio	Voice clarity.	11	3
		Sound rhythm.	12	
		Music suitability.	13	
		Amount		**13**

The data obtained in this research was then analyzed using qualitative descriptive data analysis and quantitative descriptive data analysis. Qualitative descriptive data analysis is a data analysis activity carried out if the data collection method uses qualitative methods. Meanwhile, quantitative descriptive data analysis is an activity carried out after data from all subjects or respondents or other data sources have been collected. In this development research, data analysis Qualitative descriptive is carried out by grouping qualitative data in the form of interview results, media suitability value criteria, comments, responses, criticism and suggestions for improvement. The results of the data analysis are then used to revise the products developed. Meanwhile, quantitative data analysis techniques are carried out to analyze the validity, practicality and effectiveness of the media being developed. The validity and practicality of the media is tested using a percentage formula and then the decision is made based on the conversion table for achieving scale 5. Meanwhile, the effectiveness test is carried out through a prerequisite test first, namely by carrying out a normality test using the Shapiro Wilk formula, then continuing with a homogeneity test using the Fisher formula. Or F test. After that,

3. RESULT AND DISCUSSION

Result

Research on the development of interactive multimedia based on a contextual approach was carried out at SD No. 5 Abiansemal to improve the science learning outcomes of class V students on the material on changes in the shape of objects. The design and development of interactive multimedia uses the ADDIE model, with five stages, namely the analysis, design, development, implementation and evaluation

stages.In the first stage, namely the analysis stage, learning needs analysis, student characteristics analysis, facilities and infrastructure analysis, and material analysis are carried out. Needs analysisregarding problems that occur to students and the use of learning media to support the learning process. The results obtained are studentstend to feel bored and find it difficult to understand learning material because learning media is less varied and teachers' limited ability to develop interesting learning media so that it affects student learning outcomes. Characteristics of students who prefer to learn using audio-visual learning media. Facilities and infrastructure available at SD No. 5 Abiansemal also supports using audio-visual media such as LCDs, projectors, speakers, laptops and the availability of an internet network. Material analysis shows that the material on changes in the form of objects in science content requires the help of more attractive learning media in order to motivate students in learning and improve student learning outcomes.The basic competencies and indicators of competency achievement are presented in Table 4.

Table 4. Basic Competencies and Indicators of Competency Achievement

No.	Basic Competencies	Indicators of Competence Achievement
1	Analyze the effect of heat on changes in temperature and shape of objects in everyday life.	3.7.1 Analyze the use of solid, liquid and gas objects in everyday life. 3.7.2 Describe the properties of solids, liquids and gases. 3.7.3 Analyze correct statements regarding various changes in the form of objects. 3.7.4 Examining changes in the form of objects that are influenced by heat or heat. 3.7.5 Analyze examples of changes in the form of objects that occur in everyday life.

Second stagenamely the design stage which is carried out by creating flowcharts and storyboards which aim to provide information or an overview of interactive multimedia product development. The design and appearance of the media is carried out using construct applications starting from the design of images and animations needed to support the material contained in the media, namely material changing the shape of objects in the science content. Next, learning tools and assessment instruments are prepared. The results of the interactive multimedia design developed are presentedon Figure 1.

Figure 1. Interactive Multimedia Design Results

Third phaseWhat is done in developing interactive multimedia learning media is the development stage. This stage is carried out by creating a product (recreating) by combining the necessary materials and elements until it becomes a complete product. Media is created using the application construct. Making this media includes compiling interesting learning material, creating practice questions and quizzes, as well as selecting interesting images related to the subject matter and determining the right background. At the development stage, a validity test of the assessment instrument is also carried out so that it can be used to test the feasibility (validity, practicality and effectiveness) of the product. Furthermore, the interactive multimedia that has been developed is tested on experts and product trials are carried out to obtain assessments, comments as well as suggestions for interactive multimedia for revision or improvement so that the media becomes better. The results of media development can be seen infigure 2.

Figure 2. Results of Interactive Multimedia Product Development

Fourth stagein the process of developing interactive multimedia based on this contextual approach, namely the implementation stage. The implementation stage is carried out after the media has been tested by experts, namely material, media and learning design experts and is declared valid or can be used to support the learning process in the classroom. At the implementation stage it is carried outapplication of the media developed in classroom learning. The application of interactive multimedia is carried out using a learning implementation plan (RPP) that has been prepared previously so that learning activities can be carried out in a more focused and systematic manner. This implementation stage was carried out to collect data on the practicality and effectiveness of the media being developed. Practicality data was obtained from distributing student response questionnaires and observation sheets on the implementation of learning activities. Meanwhile, effectiveness data was obtained from the implementation of the pretest and posttest.

Fifth stageWhat is done in developing interactive multimedia learning media based on a contextual approach is the evaluation stage. The evaluation stage is carried out by providing evaluations in the form of formative and summative evaluations. Formative evaluation is carried out by analyzing the validity data that has been collected, namely from expert test validation and product trials so that the media can be revised or improved. Summative evaluation was carried out to analyze data on the practicality and effectiveness of the interactive multimedia being developed. The level of practicality is assessed by providing a questionnaire on student responses to interactive multimedia and filling out an instrument sheet for observing the implementation of learning activities. Meanwhile, to determine the effectiveness of the media, it is done by giving tests in the form of a pretest and posttest.

The validity of interactive multimedia learning media is known through test results by experts such as material expert tests, media experts, learning design experts, individual trials and small group trials through administering questionnaires containing statements. Based on expert tests and trials carried out, interactive multimedia has very good qualifications so it is declared valid and can be used in learning activities in class V elementary school. The recapitulation of the results of media validity data analysis can be seen in Table 5.

Table 5. Recapitulation of Media Validity Data Analysis Results

No.	Test Subjects	Test results (%)	Percentage Qualification
1	Learning Materials Expert	93.33 %	Very good
2	Learning Design Expert	96.15 %	Very good
3	Learning Media Expert	96.15 %	Very good
4	Individual Test	98.03 %	Very good
5	Small Group Test	97.57 %	Very good

The level of practicality of the interactive multimedia based on the contextual approach that has been developed is known through testing the interactive multimedia by carrying out student response tests and observational assessments of the implementation of learning activities. Student response testing activities were carried out involving all class V students of SD No. 5 Abiansemal, totaling 18 students. Based on the student response test, the results obtained were 96.48% with very good qualifications and observations of the implementation of learning activities obtained 96.67% results with very good qualifications so that the practical criteria for implementing learning media had been met.

The effectiveness of interactive multimedia based on a contextual approach as a product in this development research was carried out using a test method in the form of multiple choice questions to obtain data on student learning outcomes before and after using interactive multimedia. The first step taken is to give a pretest to students before the media is applied. Then, it continued with giving a posttest after implementing interactive multimedia based on a contextual approach to students. Based on the results of the analysis of the pretest carried out by students, the average score obtained was 62.22 and the average score obtained from the results of the posttest carried out by students was 84.44. Based on the results obtained, there was an increase in the posttest results after implementing interactive multimedia in learning activities. So, there is an increase in student learning outcomes after studying with media. Based on the results of the t-test, a value is obtained$thitung$= 8.35. Mark$ttabel$= 1.69 then compared with a significance level of 5% with the condition df = ($n1$+$n2$) − 2 = (18 + 18) − 2 = 34. The calculation results show that$thitung$ >$ttabel$= 8.35 > 1.69 with decision making. If tcount > ttable, then H0 is rejected and H1 is accepted. So, it can be concluded that the development of interactive multimedia based on a contextual approach is effectively applied to science content regarding changes in the shape of objects for fifth grade elementary school students. So, based on this, a decision was obtained that there was a significant difference between before and after using interactive multimedia based on a contextual approach on science learning outcomes regarding changes in the shape of objects in class V elementary school.

Discussion

The results of the data analysis that has been carried out show that interactive multimedia based on a contextual approach is suitable for use in classroom learning activities. The success of developing interactive multimedia is influenced by several factors including: First, interactive multimedia based on a contextual approach can attract students' learning interest. Multimedia is defined as the use of computers to create and combine text, graphics, audio and video with links and tools that enable users to communicate and interact. (Hartono et al., 2018; Kurniawati & Nita, 2018). Meanwhile, the definition of interactive is based on the idea that presentation media are generally not equipped with tools to control what is done by the user (Shoumi, 2019; Supardi, 2020). Learning activities carried out with the help of media will provide many positive contributions, one of which is attracting attention (Octavyanti & Wulandari, 2021; Wahyu et al., 2020). Interactive multimedia is a combination of various media in the form of text, images, graphics, sound, animation, video, which are packaged with an attractive appearance to arouse students' interest in learning. (Surur et al., 2021; Wedi & Nuraini, 2021). The multimedia developed is based on a contextual approach, where this approach emphasizes students' activeness in seeking knowledge related to learning material (Octavyanti & Wulandari, 2021; Rosyida, 2018).

Second, Interactive multimedia based on a contextual approach can increase motivation. Interactive multimedia is made interesting by being equipped with images and sound so that it can increase students' learning motivation. Learning media can stimulate students and motivate students to be more enthusiastic and active in the learning process (Deliany et al., 2019; Supardi, 2020; Surur et al., 2021). The learning process using media will become more interesting so that students are motivated to learn and help students understand the material (Kasturi et al., 2022; Wulandari et al., 2019). Elementary school students are happier and more motivated to learn if learning material is presented in the form of pictures in the form of illustrations with bright colors, such as pictures in interactive multimedia. (Rosyida, 2018). Interactive multimedia is a tool equipped with control devices that can be operated by the user to select something they want (Dwiqi et al., 2020; Kurniawati & Nita, 2018).

Third, Interactive multimedia based on a contextual approach can improve student learning outcomes. The use of interactive multimedia in the learning process is able to attract students' interest, enthusiasm and motivation in participating in learning activities in class so that it can improve students' cognitive learning outcomes. (Candra et al., 2020; Supartayasa et al., 2017). Interactive multimedia that is made as attractive as possible and equipped with various ornaments such as pictures, animation, music and songs that support the learning material will certainly make it easier for students to understand the learning material presented. (Anggraeni et al., 2021; Olvah, 2022; Rati et al., 2022). Using creative and interesting learning media really helps teachers to increase student activity in participating in learning activities in class (Duwika & Paramasila, 2019; Winaya, 2019).Elementary school children are just entering the initial thinking stage, so they need learning media that can be digested by children so that they can improve student learning outcomes (Tirtayani & Pratiwi, 2021; Wulandari et al., 2019).

The results obtained in this research are in line with the results of previous research which also revealed that interactive multimedia can display material efficiently, attract students' interest and improve students' ability to solve problems. (Wedi & Nuraini, 2021). Other research results reveal that multimedia can make students learn actively with high motivation because of their interest in multimedia which is able to display tests, images, audio, animation and video. (Princess, 2018).The results of further research revealed that there was an increase in student learning outcomes after learning using interactive multimedia (Arisanti & Adnan, 2021).So based on several research results, it can be said that interactive multimedia is very suitable for use in helping students' learning process.

4. CONCLUSION

Interactive multimedia based on a contextual approach to science learning can be said to be valid, practical and effective for use in the learning process with a very good category seen from the assessment indicators of material experts, design experts, media experts, individual and small group student trials, student response tests, observation of learning implementation, as well as pretest and posttest.

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