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Interactive Multimedia Based on Project-Based Learning Model Using Articulate Storyline 3 Application on the Topic of the Human Digestive System

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ABSTRAK

Penelitian pengembangan ini dilatarbelakangi oleh penggunaan media dan model pembelajaran di sekolah dasar yang belum optimal, serta adanya penurunan hasil belajar siswa di sekolah dasar pada muatan IPA. Penelitian ini mengembangkan multimedia interaktif berbasis model Project Based Learning (PjBL) menggunakan aplikasi articulate storyline 3 pada pokok bahasan sistem pencernaan manusia. Penelitian pengembangan dilakukan dengan menggunakan model ADDIE (Analyze, Design, Development, Implementation, Evaluation). Subjek penelitian ini adalah 4 orang ahli, 3 orang guru, 6 orang siswa, dan 1 kelompok siswa kelas V. Objek penelitian ini adalah multimedia interaktif berbasis model PjBL. Metode pengumpulan data yang digunakan adalah angket/soal dan tes. Instrumen pengumpulan data yang digunakan adalah angket yang berbentuk angket tertutup dengan menggunakan skala rating dan instrumen tes pilihan ganda. Hasil penelitian pengembangan ini menunjukkan prototipe multimedia interaktif berbasis model PjBL terdiri dari 3 bagian utama yaitu tampilan pembuka, tampilan awal, dan tampilan inti, rata-rata skor kelayakan ahli media sebesar 4,71 dan isi pembelajaran ahli sebesar 4,8 dengan klasifikasi sangat baik, rata-rata skor kepraktisan oleh guru sebesar 4,89 dan oleh siswa sebesar 4,78 dengan klasifikasi sangat baik, dan multimedia interaktif berbasis model PjBL menggunakan aplikasi Articulate Storyline 3 efektif dalam meningkatkan hasil belajar siswa kelas V pada materi sistem pencernaan pada manusia.

ABSTRACT

This development research is motivated by using media and learning models in elementary schools that could have been more optimal and decreasing student learning outcomes in elementary schools in science content. This research develops interactive multimedia based on the project-based Learning (PjBL) model using the articulate storyline of three applications on the subject of the human digestive system. Development research uses the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The subjects of this study were four experts, three teachers, six students, and 1 group of fifth-grade students. The object of this research was interactive multimedia based on the PjBL model. Data collection methods used are questionnaires/questions and tests. The data collection instrument was a closed questionnaire using a rating scale and multiple-choice test instruments. This development research shows that an interactive multimedia prototype based on the PjBL model consists of 3 main parts: the opening display, the initial display, and the main display. The average media expert eligibility score is 4.71, and the expert learning content is 4.8, a very good classification. The average practicality score by the teacher is 4.89, and by students is 4.78, with a very good classification and interactive multimedia based on the PjBL model using the Articulate Storyline 3 application effectively increases fifth-grade students' learning outcomes on the human digestive system.

1. INTRODUCTION

Education is defined as a conscious effort to manifest learning conditions so that students actively develop their potential to have the strength of self-control, personality, religious spirituality, noble morals, intelligence, and skills needed by themselves, society, nation, and state (Donna et al., 2021; Fitri, 2021). The existence of education encourages every person to develop their qualities, especially with the increasingly rapid development of information and communication technology. The increasingly progressive development of information and communication technology has transformed many areas of life, including education (Lase, 2019; Muchtar et al., 2021). Good use of technology helps improve the quality of education, one of which is using technology as a medium (Widianto, 2021); (Saifudin et al., 2020). The existence of ambiguity and complexity in learning material can be alleviated through media

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provided as a mediator so that the presence of media in the teaching and learning process has a big role, and media is a strong key in actualizing success in the learning process (Muchtar et al., 2021; Sintya et al., 2020). Learning media is an important foundation that functions as a complement and a vital part of the success of the learning process (Anggraeni et al., 2021; Eri Karisma et al., 2020). Students are currently very familiar with computer technology because technology, such as computers, cell phones, and other electronic equipment, has been around since they were born. Learning media is useful in solving problems related to limited space, time, and sensory abilities (Jauhari, 2018; Dewanti dkk., 2018).

Most elementary schools in Indonesia have currently implemented the Independent Curriculum. The Ministry of Education, Culture, Research, and Technology stated that an independent curriculum is a curriculum whose implementation is adjusted to needs, environmental conditions, and competency achievement, which is the main goal (Fitriyah & Rizki Putri Wardani, 2022; Wardani et al., 2021). One of the learning contents that requires media in the learning process and is found in the Independent Curriculum is Natural and Social Sciences. Natural Sciences is one of the learning contents found in elementary school and has an important position (Atikasari, 2022; Nisah et al., 2021). For this reason, teachers in designing science learning in elementary schools should consider the involvement of students' sensory organs and the development of science and technology. Science learning content is very suitable for implementing the project-based Learning (PjBL) learning model, especially when learning science material. It is because there is a large scope of science material in elementary school that can be implemented into project activities, and this can hone students' creativity, innovation, and critical thinking toward science and is also in line with the learning demands in the Independent Curriculum (Rahardjanto et al., 2019; Supandi & Senam, 2019).

Currently, media use in science learning has yet to be implemented optimally. It is supported by a statement stating that most teachers only use and rely on books in the science learning process in class, even though the books used still have shortcomings and the presentation of the material needs to be more adequate. Apart from that, most teachers only use the lecture method and use the whiteboard as a medium to support their learning in class (Eri Karisma et al., 2020; Khoiriyah & Sari, 2018). The problems in the elementary school environment relate to teachers' difficulties in designing innovative, creative, and relevant learning media and mastering information technology (Firdaus et al., 2020; Nuraini et al., 2021).

Similar problems are also found in the field, such as the less-than-optimal use of digital-based media and project-based learning models in the learning process to support Independent Curriculum learning. Also, based on the results of interviews in the field, it was found that student learning outcomes, especially in Natural and Social Sciences learning content, had decreased. One of the materials in the Natural and Social Sciences content that is less popular and experiences a decrease in learning outcomes is the material on the human digestive system. It can be said that, based on the results of interviews, it is known that during the process of learning material about the human digestive system, students often appear unenthusiastic, less active, and get bored quickly during the learning process Besides that, there are no digital-based learning media related to the digestive system material. Humans who can make students active and enthusiastic in studying the material.

The Trends in Student Achievement in Mathematics and Science (TIMSS) survey results support the decline in learning outcomes. TIMSS is an international study that assesses students' abilities in mathematics and science. The International Association initiated it for the Evaluation of Educational Achievement (IEA). According to the TIMSS survey, the science scores in 2007, 2011, and 2015, respectively, were 427, 406, and 397. The science scores placed Indonesia at 35 out of 49 (2007), 39 out of 42 countries (2011), and 46th out of 51 countries (2015) (Karima et al., 2021). Based also on data from the results of the Program for International Student Assessment (PISA) in 2018 published by the Organization for Economic Cooperation and Development (OECD), it is stated that Indonesia's science ability category is ranked 71st out of 79 PISA participating countries with an average score 389 which is below the international average score of 500 (Prastyo, 2020).

Based on the problems found in the field, the solution to the problem is by upgrading the learning process so that it becomes better, more conducive, and able to activate students, which is adjusted to the learning objectives, characteristics, and needs of each student, needs in the field, and also adjusted with what is expected in the Independent Curriculum. The learning process can be upgraded by developing a digital learning media based on an interactive multimedia learning model based on the Project Based Learning (PjBL) learning model. This is because no digital media is available in interactive multimedia based on the PjBL model when implementing the learning process.

In line with this, it is stated that multimedia is defined as a product that originates from advances in digital technology. Interactive multimedia is a computer system containing hardware and software that facilitates combining images, video, photography, graphics, and animation with sound, text, or data controlled by a computer program (Arina et al., 2020; Egok & Hajani, 2018). Meanwhile, the Project Based

Learning (PjBL) learning model is a learning model that provides teachers with the opportunity to manage learning in the classroom by involving project work with students (Nurhasanah, 2022); (Degita et al., 2019). Project work is a form of work that contains complex tasks based on very challenging questions and problems, requiring students to design, solve problems, make decisions, study, and provide opportunities for students to work in groups (Aliriad et al., 2020; Rahardjanto et al., 2019). So, combining these two things is an innovation that can be developed to help improve student learning outcomes. Interactive multimedia based on the PjBL model will be created using the Articulate Storyline 3 application. Articulate Storyline 3 is an application that can create content through text, images, sound, animation, and video (Husna, 2022; Made et al., 2022).

Previous research on the development of interactive multimedia shows that interactive multimedia in science lessons has a positive potential effect on students' science learning outcomes and is declared suitable and practical for use in the learning (Egok & Hajani, 2018). It is relevant to other research on developing interactive multimedia on simple airplane material. It is declared feasible and practical to use as a learning medium that helps students understand the material and is declared effective in improving learning outcomes for science material (Octafiana et al., 2018). The development of interactive multimedia that will be developed has its characteristics: (1) the interactive multimedia that is developed will be based on the Project Learning (PjBL) learning model by raising problems in project activities related to public health in the digestive system so that interactive multimedia is packaged accordingly. PjBL model syntax, (2) the publication results will be in the form of a link/html which can be run via a laptop, web browser, tablet, or smartphone with the help of an internet network, and (3) practical learning media because it can be repeated and used anywhere. There are four objectives achieved in this research: (1) developing an interactive multimedia prototype based on the PjBL model on human digestive system material, (2) finding out the feasibility of interactive multimedia based on the PjBL model on human digestive system material, (3) knowing the practicality interactive multimedia based on the PjBL model on human digestive system material, and (4) determine the effectiveness of interactive multimedia based on the PjBL model on student learning outcomes on human digestive system material.

2. METHOD

Research on developing interactive multimedia based on the PjBL model uses the ADDIE model. The ADDIE model is a model that is used as a guideline in the process of developing effective, dynamic learning and providing support for the learning itself (Kurnia et al., 2019; Rohaeni, 2020). The ADDIE development model comprises five stages: analysis, design, development, implementation, and evaluation (Setiawan H. R. et al., 2021). The subjects of this research were four experts (2 media experts and two learning content experts), three teachers, and six elementary school students. The trial design used in this development research is a pre-experimental, one-shot case study. The data collection methods used in this development research are questionnaires and tests. A questionnaire is a technique for collecting survey data by distributing questions that have been designed to suit the purpose of the survey that has been created to obtain information from someone regarding the research being carried out (Dewi & Sudaryanto, 2020; Syarifuddin et al., 2021). The questionnaire/questionnaire method is used to questionnaire experts (media experts and learning content experts) and questionnaires to test media practicality by teachers and students. The written test method is a way to find out about students' knowledge, skills, intelligence, or abilities through several questions in the form of objective tests (Lestari & Parmiti, 2020; Wulan et al., 2019). The test method in this development research will be used to obtain trial data on the effectiveness of interactive multimedia based on the PjBL model on student learning outcomes on human digestive system material.

The data collection instrument used in research on the development of interactive multimedia based on the PjBL model uses the Articulate Storyline 3 application on the material on the digestive system in humans in fifth-grade elementary school, a questionnaire in the form of a closed questionnaire using a rating scale and also a multiple choice test instrument. The instrument grid for testing learning media experts, learning content experts, practicality testing by teachers, practicality testing by students, and effectiveness testing can be seen in Table 1, Table 2, Table 3, Table 4, and Table 5.

Table 1. Media Feasibility Test Instrument by Learning Content Experts

No.	Aspect	Indicator	Total Item
1	Content Quality	a) Clarity of material presentation b) Suitability of material to learning objectives c) The depth of the material	8

No.	Aspect	Indicator	Total Item
		d) Breadth of material	
		e) Suitability of the image to the material	
		f) Suitability of animation to material	
		g) Suitability of the video to the material	
		h) Clarity of the problem by the surrounding environment and the project to be carried out with the material	
2	Language Quality	a) Clarity of word meaning	2
		b) Accuracy of language use by EYD rules	
3	Quality of Practice/Test Questions	a) Suitability of the type of exercise/test to the learning objectives	1
		Total	**11**

Table 2. Media Feasibility Test Instrument by Learning Media Experts

No.	Component	Indicator	Total Item
1	Text	a) Suitability of text type and size	
		b) Clarity of the text on each point of discussion	3
		c) Match the color of the text to the background	
2	Image	a) Clarity of images in interactive multimedia	
		b) The attractiveness of the image	4
		c) Images support the explanation of the material	
		d) Suitability of image placement	
3	Animation	a) Quality of animation in interactive multimedia	2
		b) Suitability of the animation used	
4	Video	a) Video quality	
		b) Clarity of sound in the video	
		c) Suitability of images and animations in the video	6
		d) Suitability of the video to the learning material	
		e) Videos make it easier for students to understand the material	
		f) The attractiveness of the video used	
5	Audio	a) Suitability of music and sound effects	1
6	Layout	a) Suitability of text placement	
		b) Accuracy of media size	3
		c) Accuracy of menu composition	
7	Operating	a) Ease of use of interactive multimedia	2
		b) Interactive multimedia can be used repeatedly	

Table 3. Media Practicality Test Instruments by Teachers

No.	Component	Indicator	Total Item
1	Aspects of Learning Media Display	a) Overall, the interactive multimedia display is attractive	5
		b) The text in interactive multimedia can be read clearly	
		c) Images in interactive multimedia are visible and attractive	
		d) Harmony of sound with background sound in learning material videos	
		e) Attractive, interactive multimedia color display	
2	Aspects of Quality of Material Content	a) The presentation of the questions in interactive multimedia is to the learning objectives	2
		b) Interactive multimedia already has problems that are relevant to the surrounding environment	
3	Aspects of Interactive Multimedia Operation	a) Interactive multimedia can be easily used for teaching	2
		b) Interactive multimedia can be used repeatedly to help learning effectiveness	
		Total	**9**

Table 4. Media Practicality Test Instrument by Students

No.	Component	Indicator	Total Item

No.	Component	Indicator	Total Item
1	Material Aspects	a) Clarity of the material presented b) Suitability of the language used in delivering the material c) Ease of material	3
2	Multimedia Quality Aspects	a) Clarity of study instructions b) The attractiveness of the multimedia display c) The attractiveness of color in interactive multimedia d) The attractiveness of images in interactive multimedia e) Ease of use of interactive multimedia	5
3	Usefulness Aspect	a) The usefulness of media to help students understand the material/topic b) The attractiveness of the media to stimulate students' interest in learning	2
		Total	**10**

Table 5. Learning Outcomes Instruments on Human Digestive System Material

No.	Learning materials	Question Indicator	Cognitive Level	Question Form	Question Number
1	Digestive System in Humans	1. Students can identify the meaning of the human digestive system	C2	PG	1
		2. Students can determine the function of the digestive organs in humans	C3	PG	2
		3. Students can detail the sequence of the digestive system in humans	C4	PG	3
		4. Students can conclude digestive organ disorders based on the characteristics mentioned	C5	PG	4
		5. Students can examine the differences between mechanical and chemical digestion	C4	PG	5
		6. Students can diagnose the causes of digestive disorders in humans	C4	PG	8
		7. Students can determine one of the digestive organs in humans based on the picture presented	C3	PG	6,7
		8. Students can determine the main types of substances or nutrients in food that the human body needs	C3	PG	9
		9. Students can examine types of food, which are one of the main types of substances or nutrients in food	C4	PG	13
		10. Students can conclude a solution by following up on problems related to digestive disorders in humans	C5	PG	10
		11. Students can differentiate events that show the function of enzymes in the digestive organs in humans	C4	PG	12
		12. Students can relate the relationship between organs, the enzymes they produce, and their functions	C4	PG	13
		13. Students can conclude how to prevent digestive disorders in humans	C5	PG	14
		14. Students can examine the role of bacteria in the digestive organs of humans	C4	PG	15

For the instrument that has been designed to be said to be valid, a content validity test is required by judges who have competence in the variables being studied. Analysis of the content validity of the questionnaire instrument was tested using the Gregory formula. Meanwhile, the multiple-choice test

instrument was tested for the validity of the instrument items using the point biserial correlation technique (γ_{pbi}). The reliability of multiple choice instruments uses the Kunder Richardson 20 (KR-20) formula. Apart from that, different power and difficulty level tests were also carried out. After the instrument is suitable for use in data collection, the data that has been obtained is analyzed descriptively qualitatively and descriptively quantitatively. Qualitative data was obtained from reviews by experts. In contrast, quantitative data in this development research was obtained from media feasibility test data by experts, data from media practicality tests by teachers and students, and effectiveness test data.

3. RESULT AND DISCUSSION

Result

This development research was conducted to develop an interactive multimedia product based on the PjBL model using the Articulate Storyline 3 application on the digestive system material in fifth-grade elementary school humans to improve student learning outcomes. This development research was carried out through five stages of the ADDIE development model: analysis, design, development, implementation, and evaluation. The activities carried out at the analysis stage aim to provide optimal functional value to the product by first determining initial problems that can be used as reasons for developing interactive multimedia based on the PjBL model. Based on the observations and interviews, it was found that the curriculum applied was the Independent Curriculum. The students needed to be more focused on understanding the teacher's explanation during the class learning process. Then, it was reinforced by the results of distributing questionnaires to students. It was found that students preferred the visual, auditory, and kinesthetic learning styles, were interested in the learning process using technology, preferred the learning process using audio-visual media, and were more interested in being involved in project activity. Based on this, one of the media that can be developed is interactive multimedia based on the PjBL model.

A storyboard/prototype (drawing design sketch) is carried out at the design stage. The procedures at the design stage of an interactive multimedia design based on the PjBL model are: (1) Selecting the software used in the design. The software used is Articulate Storyline 3, (2) a storyboard is created, (3) in making the storyboard, an interactive multimedia design will be created, and (4) when the storyboard creation has been completed, the storyboard is then shown and discussed to the supervisor to provide input. as well as suggestions. The interactive multimedia prototype based on the developed PjBL model consists of 3 main parts: the opening display, the initial display, and the main display designed using Articulate Storyline 3 software. In the opening display section, the interactive multimedia based on the PjBL model was designed to consist of a congratulatory text display, the identity column, and the save and continue buttons.

The initial display design of an interactive multimedia product consists of a title column, a hint button leading to the hint menu, a start button leading to the start menu, and an information button leading to the information menu. The Instructions menu contains instructions for using interactive multimedia consisting of 3 slides. The start menu consists of one slide containing buttons leading to the main menu, the material, the project, and the evaluation. The menu contains supporting information about interactive multimedia development, including learning objectives, developer profiles, and references. The interactive multimedia core display contains core buttons to direct to material, project, and evaluation menus. The project menu contains project implementation instructions and project videos regarding problems related to digestive system disorders in humans. The evaluation menu contains evaluations in the form of tests that students must complete. Each slide in interactive multimedia contains a background, an exit button, other supporting animations, added sound in the background (except in the evaluation menu), and sound effects when touching and pressing buttons.

At the development stage, the design of a product is realized using the articulate storyline of three applications based on the design created previously, as well as input and suggestions from the supervisor. After the interactive multimedia product based on the PjBL model is finished, the next step is to conduct media feasibility testing by experts and practicality testing by teachers and students. Four experts assessed the feasibility test of interactive multimedia based on the PjBL model. After obtaining assessments from the four experts, the assessment data were then analyzed using an average formula to obtain a feasibility index and qualifications for the feasibility of interactive multimedia based on the PjBL model. In summary, the average analysis results from the feasibility test of interactive multimedia based on the PjBL model by media experts and learning content experts can be seen in Table 6, and Table 7.

Table 6. Results of Feasibility Tests for Interactive Multimedia Based on the PJBL Model by Media Experts

Expert	ΣX	N	M	Category
First Expert	99	21	4.71	Very High
Second Expert	99	21		

Table 7. Results of Feasibility Tests for Interactive Multimedia based on the PJBL Model by Learning Content Experts

Expert	ΣX	N	M	Category
First Expert	53	11	4.8	Very High
Second Expert	52	11		

Based on Table 6, and Table 7, after completing the media feasibility test, it was continued with a practicality test, which was viewed from the perspective of teachers as practitioners in learning and students as users of learning media. The scores obtained through assessments given by expert practitioners are analyzed to calculate the average score. In summary, the results of the average analysis of the practicality test of interactive multimedia based on the PjBL model by teachers and students can be seen in Table 8, and Table 9.

Table 8. Results of Practicality Test of Interactive Multimedia based on PJBL Model by Teachers

Practitioner	ΣX	N	M	Category
First practitioner	44	9	4,89	Very High
Second practitioner	44	9		
Third practitioner	44	9		

Table 9. Results of the Practicality Test of Interactive Multimedia based on the PJBL Model by Students

Learners	ΣX	N	M	Category
First student	47	10	4,78	Very High
Second student	49	10		
Third Student	47	10		
Fourth Student	48	10		
Fifth student	48	10		
Sixth Student	48	10		

Based on Table 8, and Table 9, interactive multimedia based on the PjBL model will be tested in target schools for this development research to determine the effectiveness of interactive multimedia based on the PjBL model on the learning outcomes of fifth-grade students on the subject of the human digestive system. Interactive multimedia based on the PjBL model developed will be delivered according to learning.

The evaluation stage is the final stage of the ADDIE model. The evaluation stages carried out include formative evaluation and summative evaluation. Formative evaluation is a data collection process carried out at each stage of development. The aspects that are looked at in formative evaluation are the course of the research process and the products produced at each stage. Meanwhile, summative evaluation is a data collection process carried out at the end of the program to determine the effectiveness of the learning media that has been developed.

Media effectiveness testing was done through pre-experiments with a one-shot case study design. Analysis was carried out using the one-sample t-test formula. Before that, a prerequisite test, the normality test of data distribution, was carried out. The significance value of learning outcomes regarding the human digestive system in the Kolmogorov-Smirnov column is 0.200; in the Shapiro-Wilk column, it is 0.172. These results show that the significance value in both columns is greater than 0.05 (5% significance level), which means the data is normally distributed. Based on the results of hypothesis testing using the one-sample t-test technique, it was found that the significance value (2-tailed) was 0.000. These results show that the significance value is smaller than 0.05 (5% significance level) or $p < 0.05$. It means that H0 is rejected and Ha is accepted. So, it is concluded that interactive multimedia based on the PjBL model using the Articulate Storyline 3 application effectively improves fifth-grade students' learning outcomes on the human digestive system.

Discussion

The results of this development research show that: (1) the average media suitability score by media experts is 4.71 and learning content experts are 4.8 with a very good classification, (2) the average practicality score by teachers is 4, 89 and students at 4.78 with a very good classification, and (3) interactive multimedia based on the PjBL model using the Articulate Storyline 3 application is effective in improving the learning outcomes of fifth-grade students on material about the human digestive system. The following are several reasons why interactive multimedia based on the PjBL model received a very good assessment.

First, this development research produces interactive multimedia based on the Project Based Learning (PjBL) model on the digestive system material in humans in fifth-grade elementary school. Compared to other interactive multimedia, this interactive multimedia has characteristics because it is based on the PjBL learning model by considering public health problems in the digestive system. The topic of material in interactive multimedia based on the PjBL model is also only devoted to material on the human digestive system, where the content in interactive multimedia will be adjusted to the syntax of the PjBL model. The advantage of the Project Based Learning (PjBL) learning model is that it carries out a learning process by involving students in project activities, where before carrying out project activities, students will be given a problem that can hone critical, creative, and innovative thinking skills, and help students develop interpersonal relationships at work. Teaching and learning activities carried out through the project-based learning stage can improve behavioral skills, such as teamwork, collaboration skills, and affection between group members, as well as achieving high-level abilities in the form of critical and creative thinking abilities as needed in the 21st century (Rahardjanto et al., 2019; Wardani et al., 2021).

Based on the findings of previous research entitled Development of Thematic Teaching Materials Based on the PjBL Model in Elementary Schools, it is declared valid and practical to be used in the thematic learning process and in the process of learning reading skills in the fourth grade of elementary school, as well as the use of integrated thematic teaching materials based on the PjBL learning model is effectively held (Ismail et al., 2021). The findings of another research entitled Developing Student Worksheets Using the PjBL Model in Elementary Schools were declared valid, practical, and effective on student learning outcomes (L. Sari et al., 2020).

Second, in developing interactive multimedia based on the PjBL model, there are learning and project problem videos. If learning using video media is related to the cone of experience in Edgar Dale's Cone of Experience theory, then video media is located in the "watch videos/films" section. This position means video/film media is better than audio or image media. In line with this explanation, it is explained that Dale's cone of experience is often used as a reference and theoretical basis for the use of media in the learning process because Edgar Dale's thoughts are seen as making an important contribution to the use of media in the field of education. When film technology began to develop (in the 1960s), previous research showed that films/videos also had the power to support a person's learning process (P. Sari, 2019).

Video media can increase students' interest in learning because students can listen and see pictures. Video capabilities can present information, explain complex concepts and processes, shorten or lengthen time, teach skills, and influence attitudes. Learning with video media makes students use their senses. The more senses are involved and used in the learning process, the greater the possibility that information can be understood (Pambudi, 2018; Yuanta, 2020). The advantages of video media are that it can meet the needs of different learning styles of students, can show message elements clearly with simultaneous sound, displays objects, places, and events in interesting moving image format, and can visualize things or events that are not may be seen directly (Isti et al., 2022; Wulandari et al., 2020).

Based on the findings of previous research entitled Development of Character Education-Oriented Learning Video Media, it was declared valid, practical, and effective for improving the abilities of class XB students majoring in institutional financial accounting at SMK Negeri 1 Singaraja for the 2018/2019 academic year. Apart from that, the findings of another research entitled Development of Multimedia-based Interactive Video Mathematics Learning Media were declared valid and tested with the result that more than 70% of students responded positively (Suseno et al., 2020; Wisada et al., 2019).

Third, learning with interactive multimedia based on the PjBL model of the human digestive system material was developed in line with Ausubel's learning theory because the material discussed is linked to real conditions in the environment around students. As with the problems presented in the video, the problem of this interactive multimedia project is related to public health in the digestive system. Ausubel's theory explains that to help students absorb new knowledge from the material, it is necessary to have initial concepts that students already have that are related to the concepts to be studied so that it determines the success or failure of a learning process. Learning in elementary schools is provided by inviting students to relate lesson material to real conditions in students' daily lives. Meaningful learning

occurs when students learn to understand the material by meaningfully linking their experiences to the material being studied (Basyir et al., 2022; Rasvani & Wulandari, 2021).

This opinion is also supported by research entitled Interactive Learning Multimedia Oriented to Ausubel Learning Theory on Natural Science Content Energy Source Material is stated to be suitable and effective for use in learning activities and is very effective in attracting students' interest so that learning becomes more interactive and can improve student learning outcomes significantly (Ardiani & Agung, 2022). Apart from that, the findings of another research with the title Ausubel Theory-Oriented Android Application on Social Sciences Content explained that the results obtained from the development feasibility test show that the Android application based on Ausubel learning theory is very suitable for use in fifth-grade social studies content and the learning process (Adiutami & Sujana, 2022).

Fourth, learning with the help of interactive multimedia based on the PjBL model is also developed in line with constructivism theory because students can be directly involved in operating it in learning. Interactive multimedia based on the PjBL model will direct students to carry out project activities aimed at solving problems in the surrounding environment related to the health of the digestive system, and students will carry out project activities by producing products related to this problem. It aligns with constructivism theory, which explains that students must build knowledge from experience. Constructivism theory emphasizes that students must explore new knowledge independently, finding solutions adapted to solving problems they experience (Hamid et al., 2019; Suparlan, 2019). To respond to the rapid development of science, an alternative is needed so that the teaching and learning process can run effectively, for which constructivism theory is expected to be one of the alternatives. It is due to constructivist thinking based on the fact that students acquire and form knowledge naturally. It means that they form knowledge based on their own experience through interaction with their environment and in their way according to the character of their intellectual development (Saputro & Pakpahan, 2021; Sulthon, 2018).

Some of the findings of previous research related to interactive multimedia, which stated that interactive multimedia in science lessons has a potentially positive effect on student learning outcomes, are then declared valid, so interactive multimedia is suitable for use in learning. It is also stated that interactive multimedia in science is a practical (Egok & Hajani, 2018). Other findings also state that the resulting research development, interactive multimedia used as a learning medium, is very interesting and effective in improving student learning outcomes (Rahmadhani et al., 2022).

The advantages of developing interactive multimedia are that it creates learning media combined with technological developments that can increase students' interest and enthusiasm for learning, influencing student learning outcomes. Through learning with interactive multimedia, students will also be trained in thinking critically, creatively, and innovatively because later, students will be asked to solve problems in the learning videos contained in interactive multimedia based on the PjBL model, which will then be implemented in project activity. The thing that differentiates this interactive multimedia from other interactive multimedia is that interactive multimedia was developed based on the Project Based Learning (PjBL) learning model by raising problems in project activities related to public health in the digestive system so that later, the steps contained in interactive multimedia are packaged according to PjBL model syntax.

Additionally, interactive multimedia based on the PjBL model includes material on the human digestive system in the science and science learning content. This research implies that it provides additional variations in the existence of learning media in the form of interactive multimedia based on the PjBL model, which is suitable for application in the learning process, as well as teachers getting additional learning resources to be applied as learning media in the learning process. Limitations in this research are the scope of material, level, learning content developed in interactive multimedia based on the PjBL model, and the number of subjects used in product implementation.

4. CONCLUSION

The research results found that the interactive multimedia prototype based on the developed PjBL model consisted of 3 main parts: the opening display, the initial display, and the main display. Interactive multimedia based on the PjBL model received a very good response, so it was declared feasible and practical for use in the learning process and was effective in improving student learning outcomes on human digestive system material based on the results of expert tests, practicality tests by teachers and students, as well as product effectiveness test analysis results. So it can be concluded that interactive multimedia based on the PjBL model using the Articulate Storyline 3 application on human digestive system material can be used in the learning process and has benefits that can increase students' interest in learning and make it easier for students to understand the material well.

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