Interactive Multimedia Based on Articulate Storylines in the Topic of Plant Anatomy and Physiology

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ABSTRAK

Dalam pelaksanaan pembelajaran daring, siswa mengalami kesulitan untuk memahami konsep pada materi yang dibelajarkan. Hal ini disebabkan karena media pembelajaran yang diberikan hanya menampilkan materi tekstual dan tidak dilengkapi contoh konkret, serta hanya memberikan siswa kegiatan melihat dan mendengar tanpa ada interaksi dari siswa. Penelitian ini bertujuan untuk menganalisis validitas dan kepraktisan multimedia pembelajaran interaktif berbasis articulate storyline pada topik bagian tubuh tumbuhan dan fungsinya kelas IV sekolah dasar. Penelitian ini termasuk jenis penelitian pengembangan dengan memakai model ADDIE. Subjek uji coba dalam penelitian ini adalah 2 ahli materi, 2 ahli media, 2 ahli desain, 2 guru, dan 12 siswa kelas IV SD. Metode kuesioner digunakan sebagai metode pengumpulan data dengan instrumen rating scale berskala 4. Data yang diperoleh dianalisis menggunakan rumus mean. Berdasarkan hasil penelitian diperoleh rata-rata skor validitas multimedia pembelajaran interaktif berbasis articulate storyline dari segi ahli materi sebesar 3,90 dengan kategori sangat baik, dari segi ahli media sebesar 3,93 dengan kategori sangat baik, dan dari segi ahli desain sebesar 3,88 dengan kategori sangat baik. Rata-rata skor kepraktisan multimedia pembelajaran interaktif berbasis articulate storyline dari respons guru sebesar 3,88 dengan kategori sangat baik, dan dari respons siswa sebesar 3,81 dengan kategori sangat baik. Berdasarkan hasil analisis tersebut, multimedia pembelajaran interaktif berbasis articulate storyline pada topik bagian tubuh tumbuhan dan fungsinya kelas IV sekolah dasar dinyatakan valid dan praktis sehingga layak digunakan dalam pembelajaran di kelas IV sekolah dasar.

ABSTRACT

In implementing online learning, students have difficulty understanding the concepts in the material being studied. The learning media provided only displays textual material and did not include concrete examples, and only provides students with viewing and listening activities without any interaction from students. This study aims to analyze the validity and practicality of interactive multimedia based on articulate storylines on plant anatomy and physiology in fourth grade elementary school. This research is a type of development research using the ADDIE model. The test subjects in this study were 2 material experts, 2 media experts, 2 design experts, 2 teachers, and 12 fourth-grade elementary school students. The questionnaire method was used as a data collection method with a rating scale instrument of 4. The data obtained were analyzed using the mean formula. Based on the results of the study, the average validity score of interactive learning based on an articulate storyline from the point of view of material experts was 3.90 with a very good category, from a media expert perspective of 3.93 with a very good category, and a design expert perspective of 3.88. with very good category. The average practicality score of interactive learning multimedia based on articulate storylines from the teacher's response was 3.88 in the very good category. The student response was 3.81 in the very good category. Based on the results of this analysis, interactive multimedia based on articulate storylines on the topic of plant anatomy and physiology in the fourth grade of elementary school is declared valid and practical so that it is suitable for use in learning in the fourth grade of elementary school.

1. INTRODUCTION

The learning process can be successful if students can gain knowledge, practice skills, and develop attitudes and self-confidence well so that students can apply the knowledge they have gained in real life. Learning success is strongly influenced by the completeness of the facilities or learning media used (Ahsani et al., 2021; Isti et al., 2020; Simamora, 2020). Learning media is a tool to convey messages that can stimulate students' thoughts, feelings, and willingness to help create the learning process (Mayasari & Kemal, 2020; Tafonao, 2018; Winarto et al., 2020). Through learning media, teachers can provide learning tools that are easily understood by students, which are abstract to concrete and eliminate verbalism (Atmojo et al., 2021; Kasanah et al., 2022; Shoimah, 2020; Sholiha et al., 2017). The use of learning media is also very influential

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on students. Students will find it easier to understand the intent and purpose of the material being studied, obtain more concrete information, can develop their curiosity (Moto, 2019; Rahmatullah et al., 2020; Setyaningrum & Waryanto, 2017)

However, learning media cannot be carried out optimally due to the Covid-19 pandemic. Based on a joint decree of four ministers regarding the implementation of learning during the Covid-19 pandemic, learning during the Covid-19 pandemic is carried out with limited face-to-face learning and distance learning (Tanuwijaya & Tambunan, 2021; R. P. Sari et al., 2021). In addition to the limited distance and infrastructure owned by students, the use of learning media that is not optimal is also due to the media being used that is less relevant to the material, student characteristics, and current conditions.

Based on the results of distributing questionnaires and interviews to teachers for fourth-grade elementary schools in Gugus VIII, Kecamatan Buleleng, it can be seen in the learning process that there are 42.9% who make learning media independently, and 57.1% use learning media obtained from the internet and media in schools. However, the availability of learning media in schools is quite limited. Based on the results of distributing questionnaires, the percentage of results is 71.4%. In addition, 57.1% stated that the learning media used was less relevant. Learning media found in schools are less relevant to use in current conditions. Learning media obtained from the internet are also not suitable for the material and characteristics of elementary school students. The media only displays textual material and does not contain concrete examples. As a result, some students still have difficulty understanding the concepts in the material being studied and making the learning process less interactive because the media only provides students with viewing and listening activities without any interaction. In addition to this, 85.7% of fourth-grade teachers in Gugus VIII of Kecamatan Buleleng also stated that the material coverage of fourth-grade students' books was still limited, one of which was on science content. In science learning, some abstract concepts need media to help understand them (Kusumastuti, 2020; Suryanda et al., 2020). In addition to this, fourth-grade elementary school students enter the concrete operational cognitive development stage at the age of 7-12 years (Bujuri, 2018; Gunawan et al., 2019; Kholiq, 2020; Marinda, 2020). At this stage, students can understand if assisted with pictures or concrete objects (Hidayati et al., 2017; Nanang, 2021). The ability of students to understand abstract material is still lacking, so media is needed to help students understand abstract science material.

It is necessary to develop a media that can help students understand the concept of abstract material to be more concrete, create interesting and interactive learning, and comply with current conditions in interactive multimedia l to overcome these problems. Interactive learning multimedia is a combination of various media elements such as video, audio, images, animation, text, and audio, as well as interactive presentation methods that can facilitate students to learn like in real life (Abdulrahaman et al., 2020; Ariani & Festiyed, 2019; Munisah, 2019; Wiana et al., 2018). Through several media elements such as video, audio, images, animation, text, and integrated audio, interactive learning multimedia is appropriate to use to clarify abstract material concepts to become more concrete. (Geni et al., 2020; Nurdyansyah, 2019). Students can operate interactive learning multimedia through the buttons provided, so students can choose what to do or learn next (Andrizal & Arif, 2017; Fadli & Hakiki, 2020). To create interactive learning multimedia, we can take advantage of various applications, one of which is the articulate storyline. The articulate storyline is software that can create interactive learning multimedia, a combination of images, text, sound, graphics, video, and animation (Aidiansyah et al., 2021; Amiroh, 2019). The articulate storyline has many menu options for editing. The results of this application can be shared and accessed by students easily via cell phones or computers. Students can answer practice questions on quizzes and immediately see the scores of the questions that have been done to help students learn independently (Indasah et al., 2021; Indriani et al., 2021).

This research is supported by the results of previous studies, which state that the development of interactive science multimedia for elementary school students has been proven valid, practical, and has the potential to affect student learning outcomes in science learning in elementary school (Egok & Hajani, 2018). Articulate storyline-based interactive learning multimedia is feasible to deliver material and can foster student learning motivation (Sari & Harjono, 2021). Interactive multimedia in fourth-grade thematic learning belongs to the very practical category. Teachers and students do not experience obstacles or difficulties operating interactive multimedia learning during learning activities. (Kumalasani, 2018).

However, from several previous studies, no one has provided an introductory menu feature in interactive multimedia learning. Preliminary activity is the provision of stimulus to students regarding the material to be studied by presenting several problems in the environment around students related to the learning material (Ramdhani et al., 2019; N. A. Sari et al., 2018). A good preliminary stage can build students' readiness to learn so that students can take part in learning well (Dhawan, 2020; Rapanta et al., 2020). In addition, in previous studies, the teacher could not know the evaluation results carried out by students on interactive multimedia learning. The results of the evaluation by students can help teachers determine

students' understanding of the material studied in interactive multimedia learning and determine the seriousness of students in operating or learning to use interactive learning multimedia (Astra et al., 2020; Wijaya et al., 2021). It is what prompted this research to be carried out. The differences and advantages of this research from previous research include an introductory section that students can respond to in this study. Before studying the material, students will be given some initial questions about the material to be discussed and associated with the student environment. The results can also know the teacher's evaluation section in this study, not only students. In addition, no one has developed interactive learning multimedia based on articulate storylines on the topic of plant body parts and their functions. This study aims to analyze the validity and practicality of interactive multimedia learning based on articulate storylines on plant body parts and their functions in the fourth grade of elementary school. Through interactive learning media based on articulate storylines, it is hoped to help students understand the material, especially plant body parts and their functions, and make the learning process interactive during this online learning.

2. METHOD

This research is a type of development research and uses the ADDIE development model. This model was chosen because it has a systematic sequence of activities and is easy to understand and implement to develop development products such as interactive multimedia learning based on articulate storylines. The ADDIE model consists of five steps: analysis, design, development, implementation, and evaluation (Tegeh et al., 2014). However, in this study, the implementation and evaluation stages were not carried out due to several obstacles: the Covid-19 pandemic, limited time, finance, and research resources.

In the analysis phase, the activities carried out include needs analysis, student characteristics analysis, curriculum analysis, and media analysis. The design stage is carried out by compiling the design of interactive learning multimedia based on an articulate storyline. At the development stage, the design that was prepared at the design stage and consulted with the supervisor was developed to produce interactive multimedia learning based on articulate storylines. The media that has been developed is consulted with the supervisor to get input and suggestions for improvement. After the media has been repaired, an expert test is carried out to review the media developed. The expert test consists of media experts, design experts, and material experts. The data obtained from the expert test results are then analyzed to determine the validity of the interactive multimedia learning based on articulate storylines that have been developed and then corrected if there are suggestions or input. After testing the validity of the developed media, it was continued with trials with teachers and students to determine the practicality of the articulate storyline-based interactive learning multimedia developed.

The test subjects in this study included two material experts, two media experts, two design experts, two teachers, and twelve fourth-grade elementary school students. This study uses a questionnaire method as a method of data collection. The questionnaire method is a data collection technique that provides a list of questions or statements to the research subject, which must be responded to in writing (Agung, 2018). The instrument used is a rating scale instrument with a scale of 1-4. The rating scale instrument collected expert validation data and teacher and student responses to the developed media. The instrument grids for material experts, media experts, design experts, teacher responses, and student responses are presented in Table 1, Table 2, Table 3, and Table 4.

Table 1. Material Expert Instrument

No	Aspect	Indicator	Item Number	Number of Items
1.	Learning	Competency compatibility	1, 2, 3	3
		Giving motivation	4,5,6	3
		Evaluation	7,8	2
2.	Contents	Material quality	9, 10, 11	3
		Material selection	12, 13	2
		Material relevance	14, 15	2
	Total			**15**

(Modified from: Suwiantini et al., 2021)

Table 2. Media Expert Instruments

No	Aspect	Indicator	Item Number	Number of Items
1.	Media Quality	Ease of use	1, 2, 3	3
		Language use	4, 5, 6	3

No	Aspect	Indicator	Item Number	Number of Items
		Selection of background music/sound	7, 8	2
2.	Media Presentation	Image quality	9, 10, 11	3
		Layout	12, 13	2
		Illustration suitability	14	1
		Total		**14**

(Modified from: Suwiantini et al., 2021)

Table 3. Design Expert Instruments

No	Aspect	Indicator	Item Number	Number of Items
1.	Accuracy	The suitability of the media with the characteristics of students	1	1
		Suitability of the material with the purpose	2	1
		Material collapse	3	1
2.	Clarity	Language clarity.	4	1
		Clarity of description and discussion.	5	1
		Clarity of content provided	6	1
3.	Interest/Attention	Motivate interest in learning	7	1
		The attention of students to learning	8	1
4.	Quiz quality	Suitability of questions with learning objectives	9	1
		The questions given are easy to understand	10	1
5.	Impact on students	Facilitate students' understanding of the material	11	1
		Creating student interaction	12	1
		Jumlah		**12**

(Modified from: Sinta et al., 2021)

Table 4. Teacher and Student Response Instruments

No	Aspect	Indicator	Item Number	Number of Items
1.	Media Presentation	Ease of Use	1, 2, 3, 4, 5	5
		Theory	6, 7, 8	3
		Appearance	9, 10, 11	3
		Giving Motivation	12, 13	2
		Language Usage	14, 15	2
		Total		15

(Modified from: Suwiantini et al., 2021)

Judges test the instrument made to determine the content validity and reliability of the instrument. The content validity test in this study used the Gregory formula, and the reliability test used the percentage of agreements formula. The results of the content validity test of the assessment instruments of material experts, media experts, design experts, teacher responses, and student responses are 0.93, 1.00, 1.00, 0.86, and 0.86, with very good content validity categories. The reliability test results of the assessment instruments of material experts, media experts, design experts, teacher responses, and student responses, respectively, are 93%, 100%, 100%, 86%, and 86%, with very good reliability categories. Based on the content validity and instrument reliability tests, the instrument is feasible to use to measure the validity and practicality of interactive multimedia learning based on articulate storylines.

This study's data analysis methods and techniques are descriptive qualitative, and quantitative. This study uses a qualitative descriptive analysis method to process data in input and suggestions from reviews by experts, teachers, and students on the interactive learning multimedia created. The review findings are then used to improve the media and products that have been made. At the same time, the quantitative descriptive analysis method was used to process data in the form of validity scores from each expert and media practicality scores from the teacher and student responses on the assessment sheet. The score obtained is then calculated on average using the mean formula. The average score is then converted into a five-scale conversion guideline to classify the validity and practicality of the developed media. The five-scale conversion guidelines are presented in Table 5.

Table 5. Five Scale Conversion Guidelines

Score Range	Category
3,25 < X ≤ 4,00	Very good
2,75 < X ≤ 3,25	Good
2,25 < X ≤ 2,75	Enough
1,75 < X ≤ 2,25	Not good
1,00 < X ≤ 1,75	Bad

(Modified from Koyan, 2012)

3. RESULT AND DISCUSSION

Result

This development research produces prototypes and interactive learning multimedia based on articulate storylines on the topic of plant body parts and their functions tested for validity and practicality. This development was obtained through several stages, namely the analysis, design, and development stages. The analysis stage is carried out through several stages, namely needs analysis, student characteristics analysis, curriculum analysis, and media analysis. The needs analysis in this study was carried out at SD Gugus VIII, Kecamatan Buleleng, using a questionnaire method addressed to the fourth-grade homeroom teacher. Based on the needs analysis results, it is known that the availability of learning media in schools is quite limited. Besides that, the scope of material in fourth-grade students' books is limited, one of which is science content. The characteristics of students analyzed at this stage are the characteristics of fourth-grade elementary school students. Based on Piaget's theory of cognitive development, elementary school students are in the concrete operational stage. At this stage, the ability of students to understand abstract material is still lacking, so it needs concrete media assistance to help students understand abstract material. In the curriculum analysis, an analysis of Core Competencies, Basic Competencies, indicators, and learning objectives is carried out, which is contained in the teacher's book and student's book, which will be used as a reference in developing media. Based on the analysis, the basic competencies, indicators, and learning objectives are presented in Table 6.

Table 6. Basic Competencies, Indicators, and Learning Objectives

Basic competencies	Indicator	Learning objectives
3.1 Analyze the relationship between the form and function of body parts in animals and plants.	3.1.1 Analyzing plant body parts and their functions. 3.1.2 Comparing the types of plant body parts. 3.1.3 Analyze the structure of plant body parts and their functions.	1. By operating, observing, and responding to interactive learning multimedia, students can correctly analyze plant body parts and their functions. 2. By operating, observing, and responding to interactive learning multimedia, students can correctly compare the types of plant body parts. 3. By operating, observing, and responding to interactive learning multimedia, students can analyze the structure of plant body parts and their functions correctly.

(Modified from: Anggari et al., 2017)

Analysis of learning media is carried out to determine the types of learning media that already exist or are used and to know the criteria or requirements for good learning media. Based on the results of initial observations, it can be seen that the learning media found in schools are less relevant to use in current conditions, and learning media obtained from the internet are also not suitable for the material and characteristics of elementary school students. The media only displays textual material and does not contain concrete examples. As a result, some students still experience difficulties understanding the material's concepts and making the learning process less interactive. The media only provides students with viewing and listening activities without any interaction from students.

The design stage is done by designing the media by the analysis that has been done by making a prototype or media design. Creating media begins with making media designs, creating characters using the Bitmoji application, creating backgrounds using the Photoshop CS6 application, creating icons and images

using Adobe Photoshop CS6, creating animated videos using the Kinemaster application creating interactive learning multimedia products using articulate storylines.

At the development stage, interactive learning multimedia is made based on the designs that have been made at the design stage. Making this interactive learning multimedia uses an articulate storyline as the main program for making products. All materials, characters, backgrounds, icons, images, and animated videos that have been created are combined in this articulate storyline application according to the design that has been made. Articulate storyline-based interactive learning multimedia consists of 9 parts: opening, main menu, information, instructions, competencies, introduction, material, evaluation, and exit. This interactive multimedia is also equipped with background music to make the learning atmosphere more enjoyable. Interactive learning multimedia is made with a ratio of 16:9. The results of interactive multimedia learning development based on articulate storylines on plant body charts and their functions for fourth-grade elementary schools can be seen in Figure 1, Figure 2, Figure 3 and Figure 4.

Figure 1. Opening

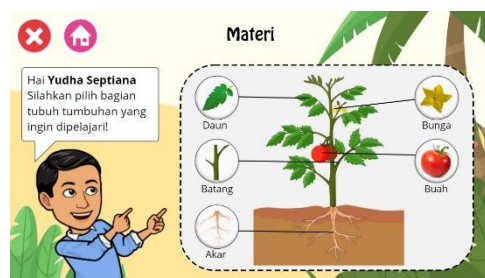**Figure 2.** Main Menu

Figure 3. Introduction

Figure 4. Content

After developing interactive learning multimedia, product trials were then carried out to determine the validity and practicality of the developed media. The validity test was carried out through 2 media experts, 2 design experts, and 2 material experts, then continued with practicality testing through trials with 2 teachers and 12 fourth grade elementary school students. Based on the validity test carried out, it was obtained that the average validity score of the media from the point of view of material experts was 3.90 with a very good category, from a media expert perspective of 3.93 with a very good category, and a design expert perspective of 3.88 with a very good category. Referring to the assessments given by material experts, media experts, and design experts, the average media validity score was 3.90 in the very good category. Furthermore, the practicality test obtained an average teacher response score of 3.88 in the very good category. Meanwhile, based on the responses given by 12 fourth-grade students of SD Negeri 2 Penglatan and SD Negeri 3 Penglatan, an average score of 3.81 was obtained, included in the very good category. Referring to the teacher's response and the student's response, the average score of media practicality was 3.85, with a very good category. The data results in the form of input, suggestions, and comments given after giving the assessment sheet are used as consideration for improving the media that has been developed.

Discussion

The analysis stage is the first stage of this research. Based on the results of the needs analysis, it is known that there are several problems: the availability of learning media in schools is quite limited. Besides that, the scope of material in fourth-grade students' books is still limited, one of which is on science content. Furthermore, in the analysis of student characteristics, fourth-grade elementary school students enter the stage of concrete operational cognitive development, namely at the age of 7-12 years (Bujuri, 2018; Gunawan et al., 2019; Kholiq, 2020; Marinda, 2020). Student's ability to understand abstract material is still

lacking at this stage. Students can understand if they are assisted with pictures or concrete objects (Hidayati et al., 2017; Nanang, 2021). In the media analysis, it is known that the learning media in schools are less relevant to use in current conditions, and learning media obtained from the internet is also not suitable for the material and characteristics of elementary school students. This is because the media only displays textual material and does not contains concrete examples. As a result, some students still have difficulty understanding the concepts in the material being studied and making the learning process less interactive because the media only provides students with seeing and listening activities without any interaction. This finding aligns with previous research stating that learning activities that only provide viewing and listening can make students less active (Efendi, 2019; Hasanah et al., 2020). Based on this, it is necessary to develop media that can be distributed to students in the implementation of online learning and can help students understand abstract material and create student interaction so that students can be active in learning. This is in line with previous research that states that online learning requires media support to help students understand the material and make the learning process active (Satyawan et al., 2021; Wakhidah et al., 2021; Widyaningsih et al., 2020). Active learning gives students seeing and listening activities and allows students to do something. In multimedia, doing something can be responding to questions given or appearing and being active in simulations or activities provided in multimedia (Chi et al., 2018; Tanis, 2020).

The design stage is done by designing the media according to the analysis that has been done by making a prototype or media design. The design or prototype for interactive learning multimedia based on articulate storylines on the topic of plant body parts and functions is as follows. The process of making media begins with making media designs. Media designs are made to find out the description of the position of each part in interactive learning multimedia. The media design consists of an opening section, main menu, instructions, information, competencies, introduction, material, and evaluation. After making the design followed by making characters, character making aims to increase the impression of interaction with students using interactive multimedia learning through greeting or responding to students. The characters are created using the bitmoji application. Next, make the background, icon, and image. Making the background, icon, and the image begins by taking some pictures from google.com, then editing and combining using the adobe photoshop CS6 application. After making backgrounds, icons, and images, followed by making animated videos, making animated videos aims to help students understand the material discussed, such as providing an overview of the process of roots absorbing water, stems carrying water from the roots, and the process of photosynthesis, and others. Animated videos are made using the kinemaster application. Furthermore, making interactive learning multimedia products, making interactive learning multimedia is done with the articulate storyline application. The articulate storyline application is the main program in making this interactive learning multimedia product. The articulate storyline is software that can be used to create interactive learning multimedia, a combination of images, text, sound, graphics, video, and animation (Amiroh, 2019; Aidiansyah et al., 2021). All materials, characters, backgrounds, icons, images, and animated videos that have been created are combined in this articulate storyline application according to the design that has been made. Previous research has also stated that through articulate storylines, we can combine several media elements such as video, images, characters, sound, and text (Puspita Sari & Wiyasa, 2021; Sindu et al., 2020; Sugihartini & Dewi, 2022). This interactive learning multimedia is also equipped with background music to make the learning atmosphere more fun. Interactive learning multimedia is made with a ratio of 16:9.

The development stage is the last in this research. At this stage, the creation of interactive multimedia learning is carried out based on the designs that have been made at the design stage. After product development, product trials are carried out to determine the validity and practicality of the developed media. The validity test was carried out through 2 media experts, 2 design experts, and 2 material experts, then continued with practicality testing through trials with 2 teachers and 12 fourth grade elementary school students. Based on the results of the validity test by material experts, media experts, and design experts, interactive multimedia learning based on articulate storylines on the topic of plant body parts and their functions for grade IV elementary school is declared valid with a very good category so that it is suitable for use in the learning process. The findings of this study are supported by several previous studies which state that the results of developing interactive multimedia learning science content for elementary school students are categorized as valid and suitable for use in learning activities. This is known based on validation trials conducted on material experts, media experts, design experts, and students in the very good category (Pradana et al., 2020; Dwiqi et al., 2020; Safira et al., 2021). Multimedia interactive learning based on articulate storylines on plant body parts and their functions for fourth-grade elementary school can also be declared valid based on the assessed aspects. The learning aspect is in the very good category because this interactive learning multimedia material comprises basic competencies, indicators, and learning objectives. It is important to consider the suitability of the content of the material with the learning objectives that students must achieve To create a good learning media (Geni et al., 2020;

Widyaningsih et al., 2020). In addition, the presentation of material in this interactive learning multimedia has a motivating quality in learning. This is in line with the results of previous studies, which state that the delivery of material using interactive multimedia learning can motivate students and improve student learning outcomes (Arifin et al., 2021; Kadarsih & Fitria, 2022; Puspitarini & Hanif, 2019; Saputri et al., 2018). The content aspect is also in the very good category because the material in interactive learning multimedia has good quality. Submission of good material can help students develop their knowledge of the subjects studied and make learning meaningful (Kim, 2020; Sudiarta & Sadra, 2016).

The aspect of media presence is also in the very good category because these interactive learning multimedia have good image quality. The image has a good resolution and follows each subject in addition to the color of the writing according to the background. In addition, the use of pictures and videos in interactive multimedia learning can help students understand the material. In addition to helping students understand, pictures and videos can help students obtain more detailed information to remember them longer (Awaludin et al., 2020; Morphew et al., 2020; Mukherjee, 2018; Pangestu et al., 2021). This statement is supported by previous research, which states that using interactive multimedia in learning can help students understand relatively abstract information (Rosamsi et al., 2019; Septiani et al., 2020). The aspect of interest or attention is in the very good category because interactive learning multimedia can motivate interest in learning and increase students' attention to learning. This is in line with the results of previous research, which states that interactive learning media based on articulate storylines can foster interest in learning and improve student learning outcomes (Ratih Rosmilasari & Adoe, 2021; Setyaningsih et al., 2020; Yolanda et al., 2022). The impact aspect for students is also in the very good category because these interactive learning multimedia can facilitate students' understanding of the material and create student interaction. Interaction is a prominent feature in this interactive learning multimedia that allows active learning, and students can be used for independent learning (Rukayah et al., 2022; Utami et al., 2021).

Based on teacher responses and student responses, interactive multimedia learning based on articulate storylines on plant body parts and their functions in fourth-grade elementary schools are stated to be practical with a very good category. It is suitable for use in the learning process. This finding is in line with the results of several previous studies, which stated that interactive multimedia was included in the very practical category to be used in the fourth-grade thematic learning process, where teachers and students had no difficulty operating interactive multimedia as an alternative learning medium to improve the quality of learning (Kumalasani, 2018). In addition, the results of developing interactive multimedia learning in elementary science learning are practical. Students respond very well to the interactive learning multimedia developed based on the one-to-one test and small group trial results (Egok & Hajani, 2018). Interactive multimedia learning based on articulate storylines on plant body parts and their functions for fourth-grade elementary schools can also be stated as practical based on the aspects assessed. The easy-to-use aspect of teacher and student responses is in the very good category because the media is easy to use. This is in line with the results of previous research, which states that interactive multimedia learning based on articulate storylines is very practical because the media is easy to use (Munawarah et al., 2021; Yolanda et al., 2022). The ease of accessing and operating the media can encourage or motivate students to open and operate the media again (Rabiman et al., 2021; Setyaningsih et al., 2020). Furthermore, the material aspect of teacher and student responses is in the very good category because the material presented in this interactive learning multimedia is easy to understand and describe coherently. It is in line with the results of previous research, which states that interactive multimedia learning based on articulate storylines can help teachers deliver material, make students interested in learning, and greatly assist students in understanding learning (Firdawela & Reinita, 2021; Islamyati & Manuaba, 2021).

This research has advantages over previous research; namely, there is an introductory part that students can respond to in this study. Preliminary activity is the provision of stimulus to students regarding the material to be studied by presenting several problems in the environment around students related to the learning material. In this interactive multimedia learning, students will be given some initial questions related to the material to be studied and associated with the student's environment before studying the material. The results can also know the teacher's evaluation section in this study, not only students. In addition, no one has developed interactive learning multimedia based on articulate storylines on the topic of plant body parts and their functions. The implication of this research is to help students understand the material, especially on the topic of plant body parts and their functions, and to create student interaction in this online learning process because students can operate and respond to questions given to the media, not only seeing and hearing. This research is limited only to the development stage, so other researchers can continue this research by continuing to the implementation and evaluation stages.

4. CONCLUSION

The interactive multimedia learning based on articulate storylines on plant body parts and their functions in the fourth grade of elementary school is declared valid and practical. It is suitable for use in learning in the fourth grade of elementary school. The use of articulate storyline-based interactive learning multimedia can help students understand the material because it is equipped with concrete examples in the form of pictures and videos and can create student interaction in the learning process because students can operate and respond to questions given in this interactive learning multimedia, not only see and hear.

5. REFERENCES

Abdulrahaman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, *6*(11), 1–14. https://doi.org/10.1016/j.heliyon.2020.e05312.

Agung, A. A. G. (2018). *Metodologi Penelitian Kuantitatif*. Singaraja: Universitas Pendidikan Ganesha.

Ahsani, E. L. F., Mastrura, E., Ni'mah, L. S., Inayah, C., & Amalia, V. (2021). Pengaruh Sarana Prasarana Dalam Menunjang Prestasi Belajar Siswa Sd Di Sekolah Indonesia Den Haag. *MODELING: Jurnal Program Studi PGMI*, *8*(1), 52–63. https://jurnal.stitnualhikmah.ac.id/index.php/modeling/article/view/686.

Aidiansyah, M. R., Wigono, L. T. H., Kurniawan, A. W., & Mu'arifin. (2021). Pengembangan Perangkat Pembelajaran Bola Voli Berbasis Aplikasi Articulate Storyline. *Sport Science and Health*, *3*(4), 154–166. http://journal2.um.ac.id/index.php/jfik/article/view/19153.

Amiroh. (2019). *Mahir Membuat Media Interaktif Articulate storyline.* Yogyakarta: Pustaka Ananda Srva.

Andrizal, & Arif, A. (2017). Pengembangan Media Pembelajaran Interaktif Pada Sistem E-Learning Universitas Negeri Padang. *INVOTEK: Jurnal Inovasi Vokasional Dan Teknologi*, *17*(2), 1–10. https://doi.org/10.24036/invotek.v17i2.75.

Anggari, A. S., Afriki, Wulan, D. R., Puspitawati, N., Khasanah, L. M., & Hendriyeti, S. (2017). *Buku Guru Tematik Kelas IV Tema 3 Peduli Terhadap Makhluk Hidup*. Kementerian Pendidikan dan Kebudayaan Republik Indonesia.

Ariani, R., & Festiyed. (2019). Analisis Landasan Ilmu Pengetahuan dan Teknologi Pendidikan dalam Pengembangan Multimedia Interaktif. *Jurnal Penelitian Pembelajaran Fisika*, *5*(2), 155–162. http://ejournal.unp.ac.id/index.php/jppf/article/view/107439.

Arifin, Z., Tegeh, I. M., & Yuda Sukmana, A. I. W. I. (2021). Independent Learning through Interactive Multimedia Based on Problem Based Learning. *Jurnal Edutech Undiksha*, *9*(2), 244–253. https://doi.org/10.23887/jeu.v9i2.41292.

Astra, I. M., Raihanati, R., & Mujayanah, N. (2020). Development of Electronic Module Using Creative Problem-Solving Model Equipped with HOTS Problems on The Kinetic Theory of Gases Material. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *6*(2), 181–194. https://doi.org/10.21009/1.06205.

Atmojo, I. R. W., Ardiansyah, R., Saputri, D. Y., & Adi, F. P. (2021). The Effectiveness of STEAM-Based Augmented Reality Media in Improving the Quality of Natural Science Learning in Elementary School. *Al-Ishlah: Jurnal Pendidikan*, *13*(2), 821–828. https://doi.org/10.35445/alishlah.v13i2.643.

Awaludin, A., Wibawa, B., & Winarsih, M. (2020). Integral Calculus Learning Using Problem Based Learning Model Assisted by Hypermedia-Based E-Book. *JPI (Jurnal Pendidikan Indonesia)*, *9*(2), 224–235. https://doi.org/10.23887/jpi-undiksha.v9i2.23106.

Bujuri, D. A. (2018). Analisis Perkembangan Kognitif Anak Usia Dasar dan Implikasinya dalam Kegiatan Belajar Mengajar. *LITERASI (Jurnal Ilmu Pendidikan)*, *9*(1), 37–50. https://doi.org/10.21927/literasi.2018.9(1).37-50.

Chi, M. T. H., Adams, J., Bogusch, E. B., Bruchok, C., Kang, S., Lancaster, M., Levy, R., Li, N., McEldoon, K. L., Stump, G. S., Wylie, R., Xu, D., & Yaghmourian, D. L. (2018). Translating the ICAP Theory of Cognitive Engagement Into Practice. *Cognitive Science*, *42*(6), 1777–1832. https://doi.org/10.1111/cogs.12626.

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018.

Dwiqi, G. C. S., Sudatha, I. G. W., & Sukmana, A. I. W. I. Y. (2020). Pengembangan Multimedia Pembelajaran Interaktif Mata Pelajaran IPA Untuk Siswa SD Kelas V. *Jurnal Edutech Undiksha*, *8*(2), 33. https://doi.org/10.23887/jeu.v8i2.28934.

Efendi, N. M. (2019). Revolusi Pembelajaran Berbasis Digital (Penggunaan Animasi Digital Pada Start Up Sebagai Metode Pembelajaran Siswa Belajar Aktif). *Habitus: Jurnal Pendidikan, Sosiologi, &*

Antropologi, *2*(2), 173–182. https://doi.org/10.20961/habitus.v2i2.28788.

Egok, A. S., & Hajani, T. J. (2018). Pengembangan Multimedia Interaktif pada Pembelajaran IPA bagi Siswa Sekolah Dasar Kota Lubuklinggau. *Journal of Elementary School (JOES)*, *1*(2), 141–157. https://doi.org/10.31539/joes.v1i2.446.

Fadli, R., & Hakiki, M. (2020). Validitas Media Pembelajaran Interaktif Berbasis Android Pada Mata Pelajaran Komputer dan Jaringan Dasar di Sekolah Menengah Kejuruan. *Jurnal Inovasi Pendidikan Dan Teknologi Informasi*, *1*(1), 9–15. http://ejournal.stkip-mmb.ac.id/index.php/JIPTI/article/view/302.

Firdawela, I., & Reinita, R. (2021). Pengembangan Media Pembelajaran Articulate Storyline Menggunakan Model Think Pair Share di Kelas IV Sekolah Dasar. *Jurnal PGSD: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *14*(2), 99–112. https://doi.org/10.33369/pgsd.14.2.99-112.

Geni, K. H. Y. W., Sudarma, I. K., & Mahadewi, L. P. P. (2020). Pengembangan Multimedia Pembelajaran Interaktif Berpendekatan CTL Pada Pembelajaran Tematik Siswa Kelas IV SD. *Jurnal Edutech Undiksha*, *8*(2), 1–16. https://doi.org/10.23887/jeu.v8i2.28919.

Gunawan, Prawoto, A., & Sumarmo, U. (2019). Mathematical Reasoning and Self Regulated Learning According to Student's Cognitive Stage. *(Jiml) Journal of Innovative Mathematics Learning*, *2*(1), 39–52. https://doi.org/10.22460/jiml.v2i1.p39-52.

Hasanah, H., Nugraheni, P., & Purwoko, R. Y. (2020). Analisis Kendala Penerapan Pendekatan Saintifik dalam Pembelajaran Barisan dan Deret Geometri. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *11*(1), 16–26. https://doi.org/10.15294/kreano.v11i1.20663.

Hidayati, A. N., Halimah, M., & Mulyadiprana, A. (2017). Pengaruh Penggunaan Media Diorama terhadap Hasil Belajar Siswa pada Materi Kegiatan Ekonomi. *PEDADIDAKTIKA: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *4*(1), 338–348. https://ejournal.upi.edu/index.php/pedadidaktika/article/view/7417.

Indasah, S., Sulistiana, D., & Sholihah, M. (2021). Pengembangan Media Articulate Storyline pada Materi Klasifikasi Makhluk Hidup Kelas X SMA. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, *12*(1), 70–83. https://doi.org/10.24127/bioedukasi.v12i1.3756.

Indriani, M. S., Artika, I. W., & Ningtias, D. R. W. (2021). Penggunaan Aplikasi Articulate Storyline Dalam Pembelajaran Mandiri Teks Negosiasi. *Jurnal Pendidikan Bahasa Dan Sastra Indonesia*, *11*(1), 25–36. https://ejournal.undiksha.ac.id/index.php/JJPBS/article/view/29316.

Islamyati, M. P., & Manuaba, I. B. S. (2021). Multimedia Interactive Learning in Science Subjects for Grade Fourth Elementary School Students. *Indonesian Journal Of Educational Research and Review*, *4*(2), 201–212. https://doi.org/10.23887/ijerr.v4i2.39664.

Isti, A. L., Agustiningsih, & Wardoyo, A. A. (2020). Pengembangan Video Animasi Materi Sifat-Sifat Cahaya Untuk Siswa Kelas IV Sekolah Dasar. *Edustream: Jurnal Pendidikan Dasar*, *4*(1), 21–28.

Kadarsih, I., & Fitria, Y. (2022). *Implementation of Learning Using Interactive Multimedia Based on Android On Theme 9 be Class V SD*. *6*(1), 57–65.

Kasanah, U., Zaini, M., Efendi, N., Wijayanto, A., & Setyowati, E. (2022). Development of Smart Snake and Ladder Media in Mastery of English Vocabulary Grade III at SDI Babussalam Pandean Durenan Trenggalek. *Journal Corner of Education, Linguistics, and Literature*, *1*(4), 216–226. https://doi.org/10.54012/jcell.v1i4.45.

Kholiq, A. (2020). How is Piaget's Theory Used to Test The Cognitive Readiness of Early Childhood in School? *Indonesian Journal of Early Childhood Education Studies*, *9*(1), 24–28. https://doi.org/10.15294/ijeces.v9i1.37675.

Kim, J. (2020). Learning and Teaching Online During Covid-19: Experiences of Student Teachers in an Early Childhood Education Practicum. *International Journal of Early Childhood*, *52*(2), 145–158. https://doi.org/10.1007/s13158-020-00272-6.

Koyan, I. W. (2012). *Statistik Teknik Analisis Data Kuantitatif*. Singaraja: Universitas Pendidikan Ganesha.

Kumalasani, M. P. (2018). Kepraktisan Penggunaan Multimedia Interaktif Pada Pembelajaran Tematik Kelas IV SD. *Jurnal Bidang Pendidikan Dasar*, *2*(1A), 1–11. https://doi.org/10.21067/jbpd.v2i1A.2345.

Kusumastuti, F. A. (2020). Pengaruh Integrasi E-Book Interaktif pada Kegiatan Belajar Mengajar Sains. *Business Economic, Communication, and Social Sciences (BECOSS) Journal*, *2*(1), 83–88. https://doi.org/10.21512/becossjournal.v2i1.6063.

Marinda, L. (2020). Teori Perkembangan Kognitif Jean Piaget dan Problematikanya Pada Anak Usia Sekolah Dasar. *Jurnal An-Nisa :Jurnal Kajian Perempuan & Keislaman*, *13*(1), 116–152. https://doi.org/https://doi.org/10.35719/annisa.v13i1.26.

Mayasari, L. I., & Kemal, I. (2020). The Role of Teachers in Implementing Distance Learning in The Middle of The Covid-19 Plague. *Systematic Reviews in Pharmacy*, *11*(12), 1553–1557. https://www.sysrevpharm.org/articles/the-role-of-teachers-in-implementing-distance-learning-

in-the-middle-of-the-covid19-plague.pdf.

Morphew, J. W., Gladding, G. E., & Mestre, J. P. (2020). Effect of presentation style and problem-solving attempts on metacognition and learning from solution videos. *Physical Review Physics Education Research*, *16*(1), 1–18. https://doi.org/10.1103/PhysRevPhysEducRes.16.010104.

Moto, M. M. (2019). Pengaruh Penggunaan Media Pembelajaran dalam Dunia Pendidikan. *Indonesian Journal of Primary Education*, *3*(1), 20–28. https://doi.org/10.17509/ijpe.v3i1.16060.

Mukherjee, S. (2018). Role of Multimedia in Education. *Edelweiss Applied Science and Technology*, *2*(1), 245–247. https://doi.org/10.33805/2576-8484.149.

Munawarah, Z., Burhanuddin, Sofia, B. F. D., & Hakim, A. (2021). Pengembangan Multimedia Pembelajaran Interaktif Berbantuan Aplikasi Articulate Storyline Dalam pembelajaran Kimia Kelas XI MIPA SMAN 1 Utan. *Journal Ilmiah Profesi Pendidikan*, *6*(4), 767–775. https://doi.org/http://dx.doi.org/10.29303/jipp.v6i4.295.

Munisah, E. (2019). Model Desain Multimedia Pembelajaran. *Edukasi Lingua Sastra*, *17*(2), 139–150. https://doi.org/10.47637/elsa.v17i2.46.

Nanang. (2021). Pelatihan Penyusunan Perangkat Pembelajaran CAI-Kontekstual Matematika Bagi Guru-Guru SD. *International Journal of Community Service Learning*, *5*(3), 250–258. https://doi.org/10.23887/ijcsl.v5i3.39481.

Nurdyansyah. (2019). *Media Pembelajaran Inovatif*. Sidoarjo; UMSIDA Press.

Pangestu, W. A., Adiwijaya, P. A., & Purnami, N. M. A. (2021). Improving Students' Writing Skill Through the Implementation of Animated Short Movie in Teaching Writing Narrative Text. *Language and Education Journal Undiksha*, *4*(2), 114–124. https://ejournal.undiksha.ac.id/index.php/JJPBI/article/view/37669/0.

Pradana, I., Setyosari, P., & Sulthoni, S. (2020). Pengembangan Multimedia Pembelajaran Interaktif Berbasis Android Pada Mata Pelajaran Ilmu Pengetahuan Alam Materi Cahaya. *JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran): Kajian Dan Riset Dalam Teknologi Pembelajaran*, *7*(1), 26–32. https://doi.org/10.17977/um031v7i12020p026.

Puspita Sari, N. K. D., & Wiyasa, I. K. N. (2021). Development of Interactive Learning Multimedia Indonesia's Cultural Diversity Material in Social Sciences Learning for Grade IV Elementary School Students. *Journal of Education Technology*, *5*(1), 48–59. https://doi.org/10.23887/jet.v5i1.32053.

Puspitarini, Y. D., & Hanif, M. (2019). Using Learning Media to Increase Learning Motivation in Elementary School. *Anatolian Journal of Education*, *4*(2), 53–60. https://doi.org/10.29333/aje.2019.426a.

Rabiman, R., Sudira, P., Sofyan, H., & Nurtanto, M. (2021). Practical Learning Media in Subject Maintenance of Chassis and Power (MCP) Based Online: Simple Learning Using Videos on YouTube. *International Journal of Interactive Mobile Technologies (IJIM)*, *15*(03), 130–145. https://doi.org/10.3991/ijim.v15i03.14943.

Rahmatullah, Inanna, Rakib, M., Mustari, & Rabania. (2020). Developing Tematic Economic Comic with Characters for Early Childhood. *Journal of Educational Science and Technology (EST)*, *6*(3), 293–300. https://ojs.unm.ac.id/JEST/article/view/14949.

Ramdhani, M. T., Lastaria, & Ariyadi. (2019). Pembelajaran Ekonomi dalam Islam pada Materi Mudharabah di Pondok Pesantren. *Anterior Jurnal*, *19*(1), 32–40. https://doi.org/10.33084/anterior.v19i1.1167.

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education*, *2*(3), 923–945. https://doi.org/10.1007/s42438-020-00155-y.

Ratih Rosmilasari, D. M. A., & Adoe, D. P. (2021). Design and Implementation of Online Problem Based Learning (PBL) Assisted by Innovative Media to Improve Elementary School Student Learning Outcomes. *Journal of Education Technology*, *4*(4), 456–464. https://doi.org/10.23887/jet.v5i1.29929.

Rosamsi, S., Miarsyah, M., & Ristanto, R. H. (2019). Interactive Multimedia Effectiveness in Improving Cell Concept Mastery. *Journal of Biology Education*, *8*(1), 56–61. https://doi.org/10.15294/jbe.v8i1.28154.

Rukayah, Andayani, & Syawaludin, A. (2022). Learner's needs of interactive multimedia based on hybrid learning for TISOL program. *Journal of Language and Linguistic Studies*, *18*(1), 619–632.

Safira, A. D., Sarifah, I., & Sekaringtyas, T. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Web Articulate Storyline pada pembelajaran IPA di Kelas V Sekolah Dasar. *Prima Magistra: Jurnal Ilmiah Kependidikan*, *2*(2), 237–253. https://doi.org/10.37478/jpm.v2i2.1109.

Saputri, D. Y., Rukayah, & Indriayu, M. (2018). Need Assessment of Interactive Multimedia Based on Game in Elementary School: A Challenge into Learning in 21st Century. *International Journal of Educational Research Review*, *3*(3), 1–8. https://doi.org/10.24331/ijere.411329.

Sari, N. A., Akbar, S., & Yuniastuti. (2018). Penerapan pembelajaran tematik terpadu di sekolah dasar. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *3*(12), 1572–1582. http://journal.um.ac.id/index.php/jptpp/article/view/11796.

Sari, R. K., & Harjono, N. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Articulate Storyline Tematik Terhadap Minat Belajar Siswa Kelas 4 SD. *Jurnal Pedagogi Dan Pembelajaran*, *4*(1), 122–130. https://ejournal.undiksha.ac.id/index.php/JP2/article/view/33356.

Sari, R. P., Tusyantari, N. B., & Suswandari, M. (2021). Dampak Pembelajaran Daring Bagi Siswa Sekolah Dasar Selama Covid-19. *Prima Magistra: Jurnal Ilmiah Kependidikan*, *2*(1), 9–15. https://doi.org/10.37478/jpm.v2i1.732.

Satyawan, I. M., Wahjoedi, W., & Swadesi, I. K. I. (2021). The Effectiveness of Online Learning Through Undiksha E-Learning During the Covid-19 Pandemic. *Journal of Education Technology*, *5*(2), 191–199. https://doi.org/10.23887/jet.v5i2.32364.

Septiani, A. N. S. I., Rejekiningsih, T., Triyanto, & Rusnaini. (2020). Development of Interactive Multimedia Learning Courseware to Strengthen Students' Character. *European Journal of Educational Research*, *9*(3), 1267–1279. https://doi.org/10.12973/eu-jer.9.3.1267.

Setyaningrum, W., & Waryanto, N. H. (2017). Media Edutainment Segi Empat Berbasis Android: Apakah Membuat Belajar Matematika Lebih Menarik? *Jurnal Mercumatika : Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *2*(1), 40–56. https://doi.org/10.26486/jm.v2i2.369.

Setyaningsih, S., Rusijono, R., & Wahyudi, A. (2020). Pengaruh Penggunaan Media Pembelajaran Interaktif Berbasis Articulate Storyline Terhadap Motivasi Belajar dan Hasil Belajar Siswa Pada Materi Kerajaan Hindu Budha di Indonesia. *Didaktis: Jurnal Pendidikan Dan Ilmu Pengetahuan*, *20*(2), 144–156. https://doi.org/10.30651/didaktis.v20i2.4772.

Shoimah, R. N. (2020). Penggunaan Media Pembelajaran Konkrit Untuk Meningkatkan Aktifitas Belajar dan Pemahaman Konsep Pecahan Mata Pelajaran Matematika Siswa Kelas III Mi Ma'Arif Nu Sukodadi-Lamongan. *MIDA : Jurnal Pendidikan Dasar Islam*, *3*(1), 1–18. https://doi.org/10.52166/mida.v3i1.1836.

Sholiha, M., Tamam, B., & Munawaroh, F. (2017). Pengembangan Media Kotak Cahaya Pelajaran IPA Materi Sifat-Sifat Cahaya. *Jurnal Ilmiah Rekayasa*, *10*(1), 34–43. https://doi.org/10.21107/rekayasa.v10i1.3602.

Simamora, R. M. (2020). The Challenges of Online Learning during the COVID-19 Pandemic: An Essay Analysis of Performing Arts Education Students. *Studies in Learning and Teaching*, *1*(2), 86–103. https://doi.org/10.46627/silet.v1i2.38.

Sindu, I. G. P., Santyadiputra, G. S., & Permana, A. A. J. (2020). The effectiveness of the application of Articulate Storyline 3 learning object on student cognitive on Basic Computer System courses. *Jurnal Pendidikan Vokasi*, *10*(3), 290–299. https://doi.org/10.21831/jpv.v10i3.36094.

Sinta, N. A. K., Astawan, I. G., & Suarjana, I. M. (2021). Belajar Subtema 3 Lingkungan dan Manfaatnya dengan Media Pembelajaran Interaktif Berbasis Articulate Storyline 3. *Mimbar PGSD Undiksha*, *9*(2), 211–219. https://ejournal.undiksha.ac.id/index.php/JJPGSD.

Sudiarta, I. G. P., & Sadra, I. W. (2016). Pengaruh Model Blended Learning Berbantuan Video Animasi Terhadap Kemampuan Pemecahan Masalah dan Pemahaman Konsep Siswa. *Jurnal Pendidikan Dan Pengajaran*, *49*(2), 48–58. https://doi.org/10.23887/jppundiksha.v49i2.9009.

Sugihartini, N., & Dewi, P. E. D. M. (2022). *Developing Interactive Media For Assessment and Evaluation Course*. *19*(1), 56–65. https://ejournal.undiksha.ac.id/index.php/JPTK/article/view/41674.

Suryanda, A., Azrai, E. P., & Setyorini, D. (2020). Media Pembelajaran Inovatif Berbasis Potensi Lokal untuk Meningkatan Kompetensi Profesional Guru IPA. *Jurnal SOLMA*, *9*(1), 121–130. https://doi.org/10.29405/solma.v9i1.4406.

Suwiantini, L. A., Jampel, I. N., & Astawan, I. G. (2021). Learn Energy Sources with Interactive Learning Multimedia. *Jurnal Ilmiah Sekolah Dasar*, *5*(1), 119–128. https://doi.org/10.23887/jisd.v5i1.35000.

Tafonao, T. (2018). Peranan Media Pembelajaran Dalam Meningkatkan Minat Belajar Mahasiswa. *Jurnal Komunikasi Pendidikan*, *2*(2), 103–113. https://doi.org/10.32585/jkp.v2i2.113.

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, *28*, 1–25. https://doi.org/10.25304/rlt.v28.2319.

Tanuwijaya, N. S., & Tambunan, W. (2021). Alternatif Solusi Model Pembelajaran untuk Mengatasi Resiko Penurunan Capaian Belajar dalam Pembelajaran Tatap Muka Terbatas di Masa Pandemic Covid 19 (Studi Kasus Analisis Kebijakan Pendidikan). *Jurnal Manajemen Pendidikan*, *10*(2), 80–90. https://doi.org/10.33541/jmp.v10i2.3272.

Tegeh, I. M., Jampel, I. N., & Pudjawan, K. (2014). *Buku Ajar Model Penelitian Pengembangan*. Singaraja:

Universitas Pendidikan Ganesha.

Utami, L. P. R. A., Suwastini, N. K. A., Dantes, G. R., Suprihatin, C. T., & Adnyani, K. E. K. (2021). Virtual Reality For Supporting Authentic Learning In 21st Century Language Classroom. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *18*(1), 132–141. https://doi.org/10.23887/jptk-undiksha.v18i1.32376.

Wakhidah, N., Erman, E., Widyaningrum, A., & Aini, V. N. (2021). Reflection Online Learning During Pandemic and New Normal: Barriers, Readiness, Solutions, and Teacher Innovation. *JPI (Jurnal Pendidikan Indonesia)*, *10*(3), 464–474. https://doi.org/10.23887/jpi-undiksha.v10i3.31093.

Wiana, W., Barliana, M. S., & Riyanto, A. A. (2018). The Effectiveness of Using Interactive Multimedia Based on Motion Graphic in Concept Mastering Enhancement and Fashion Designing Skill in Digital Format. *International Journal of Emerging Technologies in Learning (IJET)*, *13*(02), 4–20. https://doi.org/10.3991/ijet.v13i02.7830.

Widyaningsih, S. W., Yusuf, I., Prasetyo, Z. K., & Istiyono, E. (2020). Online Interactive Multimedia Oriented to HOTS through E-Learning on Physics Material about Electrical Circuit. *JPI (Jurnal Pendidikan Indonesia)*, *9*(1), 1–14. https://doi.org/10.23887/jpi-undiksha.v9i1.17667.

Wijaya, H., Tari, E., Sumule, L., Weismann, I. T. J., & Supartini, T. (2021). Online Learning Evaluation in Higher Education: Study Survey Method. *Journal of Education Technology*, *5*(3), 401–408. https://doi.org/10.23887/jet.v5i3.35466.

Winarto, W., Syahid, A., & Saguni, F. (2020). Effectiveness the Use of Audio Visual Media in Teaching Islamic Religious Education. *International Journal of Contemporary Islamic Education*, *2*(1), 81–107. https://doi.org/10.24239/ijcied.Vol2.Iss1.14.

Yolanda, S., Winarni, R., & Yulisetiani, S. (2022). The New Way Improve Learners' Speaking Skills: Picture and Picture Learning Media Based on Articulate Storyline. *Journal of Education Technology*, *6*(1), 173–181.