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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

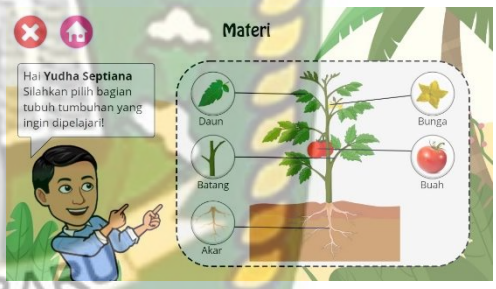

Figure 4. Content

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.

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Teacher as a Motivator: Gender, Ownership of Educator Certificates, and Age of Elementary Teachers in Improving Student Motivation during Online Learning

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ABSTRAK

Proses pembelajaran daring di masa pandemi Covid-19 cenderung lebih sulit dan berakibat pada penurunan motivasi belajar siswa di SD. Guru SD memiliki peranan yang cukup penting dalam meningkatkan dan memelihara motivasi siswa selama mengikuti proses pembelajaran daring. Penelitian ini bertujuan mendeskripsikan peran guru ditinjau dari segi gender, kepemilikan sertifikat pendidik, dan usia guru dalam meningkatkan motivasi siswa selama pembelajaran daring. Metode yang digunakan dalam penelitian ini adalah metode deskriptif, dengan teknik analisis data secara kuantitatif. Responden dalam penelitian ini adalah guru SD sebanyak 11 orang. Penentuan sampel menggunakan teknik sampling jenuh. Metode pengumpulan data dalam penelitian ini adalah kuisioner. Kuisioner yang digunakan terdiri atas 15 butir pertanyaan yang mengacu pada 5 aspek guru sebagai motivator. Terdapat perbedaan peran guru sebagai motivator jika ditinjau dari segi gender, kepemilikan sertifikat pendidik, dan usia guru. Hasil penelitian menunjukan bahwa guru SD telah berupaya memotivasi siswa selama pembelajaran daring dengan skor dominan baik. Sayangnya, pada beberapa aspek masih berada pada kategori cukup, yaitu pada indikator memberi reward-punishment, aspek variasi proses pembelajaran, dan aspek penggunaan teknologi. Hasil penelitian selanjutnya menunjukan bahwa guru perempuan lebih unggul dibanding guru laki-laki, guru non sertifikat pendidik lebih unggul dibanding guru bersertifikat pendidik, serta guru usia muda lebih unggul dibandingkan guru usia tua.

ABSTRACT

The online learning process during the Covid-19 pandemic tends to be more difficult and makes the students' motivation in elementary school low. Elementary school teachers have an important role in increasing and maintaining student motivation during the online learning process. This study aims to describe the role of teachers in terms of gender, ownership of educator certificates, and teacherage in increasing student motivation during online learning. The method used in this research is a descriptive method with quantitative data analysis techniques. Respondents in this study were elementary school teachers, as many as 11 people. Determination of the sample using a saturated sampling technique. The data collection method in this study was a questionnaire. The questionnaire consisted of 15 questions referring to 5 aspects of the teacher as a motivator. There are differences in the teacher's role as a motivator regarding gender, ownership of educator certificates, and teacherage. The results showed that elementary school teachers had tried to motivate students during online learning with a good dominant score. Unfortunately, some aspects are still in enough category, namely the indicators of giving reward-punishment, elements of the variation of the learning process, and aspects of using technology. The results also show that female teachers are better than male teachers, non-certified teachers are better than certified educators, and young teachers are better than older teachers.

1. INTRODUCTION

Online methods organize the encoding process during the Covid-19 pandemic. Online learning, commonly known as distance learning (PJJ), utilizes the internet network so that it can cause a variety of interactions in it (Ahmad et al., 2020; Lubis & Dasopang, 2021; Sadikin & Hamidah, 2020). Online education is an organized educational process that bridges the distance between teachers and students through technology (Ambarita et al., 2021). Online learning provides flexibility or freedom for students to study anywhere, anytime, and with anyone. Interaction between teachers and students in daring learning is carried out with various applications, such as google meet, google classroom, zoom, live chat WhatsApp group, video conference, or other supporting applications connected to the internet (Dewi, 2020; Khurriyati et al., 2021; Syarifudin, 2020).

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In the implementation of online learning, several problems or obstacles cause the learning process not to be implemented optimally. Some of these concerns include the limitations of teachers, parents of students, or students in the mastery of technology, loads of internet access in some areas, the absence of online learning support facilities, and the condition of the learning environment is less supportive or less conducive (Asmuni, 2020; Ihwanah, 2020; Juliya & Herlambang, 2021). Online learning problems experienced by teachers and students affect student learning motivation (Juliya & Herlambang, 2021; Widikasih et al., 2021). The issues that arise affect interaction, liveliness, feelings of pleasure and enthusiasm, and student learning motivation. Then, online learning is said to be more difficult for students, thus causing a decrease in student learning motivation in schools (Meşe et al., 2021; Puteri et al., 2020). The reduction in stimulus can be caused by low real-time interaction conducted by teachers or interaction between students and other students during the online learning process (Meşe et al., 2021).

Motivation is an important thing that must exist to achieve learning goals. Motivation is an encouragement to do something and achieve certain goals (Emda, 2018; Filgona et al., 2020). Motivation is the desire or passion for doing something. That is, without motivation in yourself, all activities will not run smoothly (Emda, 2018; Oktiani, 2017). If it is associated with learning, motivation is an encouragement or passion for following learning activities. The level of motivation of students is important to know by the teacher. The existence of knowledge and understanding of learning motivation in students will provide many benefits (Khoirunnisa & Widiati, 2021; Sumarsono et al., 2020). First, it is to awaken, improve, and nurture the student's spirit to learn until it succeeds and achieves the goals that have been set. Second, improve and revitalize teachers to choose one role from the number of teacher roles. Third, give teachers job opportunities in pedagogical competence. A teacher is also required to understand the characteristics of each individual in the classroom so that later it can build, maintain, and increase the motivation of its students in learning (Oktiani, 2017; Sabaniah et al., 2021). If students already have high motivation in education, then indirectly, the skills and knowledge will increase (Khoirunnisa & Widiati, 2021). In the implementation of learning, a teacher must be able to be a motivator (Filgona et al., 2020; Mariyani & Rezania, 2021; Mayasari & Kemal, 2020; Sabaniah et al., 2021). With a teacher's motivation, students will be more confident and practice developing and showing their best. Creative teachers and good teachers can utilize everything in learning activities to increase student learning motivation (Haider & Jalal, 2018; Oktiani, 2017). Thus, teachers have an important role in increasing student motivation, especially in the online learning process.

The role of the teacher as a motivator can be reviewed from several indicators. Some indicators of teachers as motivators for students such as teachers provoke passions and desires in learning, teachers provide encouragement and explore the needs in education, teachers associate learning with hopes and ideals of the future, teachers reward (reward) in learning, teachers hold interesting and fun activities in learning, teachers create conducive learning environments, create competition and cooperation between learners and teachers, and evaluate or comment on learners' work /learning outcomes (Johnson, 2017; Manizar, 2017; Nurafrianti et al., 2020; Oktiani, 2017; Sabaniah et al., 2021). These eight indicators must be understood and implemented concerning building, maintaining, and improving students' motivation in learning. This role is very important in learning as a motivator, especially in online education. Unfortunately, the part of teachers as motivators in terms of gender, ownership of educator certificates, and the age of teachers in online learning have not been found in previous studies. Existing studies mostly only describe the role of teachers as motivators in general in the online learning process and are not focused on aspects of teachers as motivators (Mariyani & Rezania, 2021; Saumi et al., 2021; Winarsieh & Rizqiyah, 2020).

The data about the role of teachers as motivators, is very important to be known to be used as a foothold to improve or improve the quality of online learning in the future. Policies regarding the learning process in the future still can not be predicted. The online learning process has a considerable opportunity to stay implemented in line with the advancement of information technology in the 21st century. Teachers must continue to improve and reflect on the online learning process implemented, especially in the role of a learning motivator. Based on the description of the problem, this study aims to analyze the role of teachers in increasing student motivation during online learning and analyze the part of teachers as motivators in terms of gender, ownership of educator certificates, and teacherage. Hopefully, the results of this study can be used as a foothold and reflection for the development of teacher competence.

2. METHOD

The study aims to describe the role of teachers in increasing student motivation during online learning and analyze the part of teachers as motivators in terms of gender, ownership of educator certificates, and teacherage. To achieve this goal, the study used descriptive methods. Descriptive research methods are not intended to test a particular hypothesis but merely describe or describe a thing as it is

about a variable (Zellatifanny & Mudjiyanto, 2018). Descriptive research describes a phenomenon and its characteristics (Riastini et al., 2021).

This research is limited to teachers in State Elementary School 1 Pohsanten. The findings in this study only represent teachers in elementary school only. The research was conducted at SD Negeri 1 Pohsanten, Pohsanten Village, Mendoyo Subdistrict, Jembrana Regency. All teachers in the school were involved as research respondents. The teachers involved consist of classroom teachers, subject teachers, and local charge teachers. The number of teachers in the school is 11 people, with 7 male teachers and 4 female teachers. The eleven teachers in SD Negeri 1 Pohsanten involved in this study were undergraduate educated (S1). 5 teachers respondents have attended the teacher profession education (PPG) and are certified. The determination of the sample used is to use saturated sampling techniques. Saturated sampling is a sampling technique that uses all population members as samples (Sugiyono, 2018).

The research instrument used is a questionnaire. This questionnaire contains 15 questions. The details of the question refer to the 5 aspects of teacher indicators as motivators. These aspects are: First, the teacher provokes desire, interest and desire in learning. Second, the teacher encourages and explores the need for learning. Third, the teacher rewards learning. Fourth, the teacher holds interesting and fun activities in learning. Fifth, the teacher evaluates or comments on learners' work/learning outcomes. Experts have validated the instruments in this study before use. The questionnaire answers consist of 5 answer options, namely SB (Excellent), B (Good), C (Enough), K (Less), and TP (Never). The grid of research instruments is presented in Table 1.

Table 1. Instrument Grid

No.	Aspects	Indicator
1	Teachers provoke passions, interests and desires in learning	1. Teachers provide stimulus to stimulate children's desire to learn 2. Teachers use relevant media in online learning
2	Teachers encourage and explain the need for learning.	1. The teacher conveys the things needed during the learning process 2. The teacher gives positive words to students during the learning 3. The teacher appreciates students' answers, work, and learning progress. 4. Teacher guides and gives guidance if students face difficulties
3	Teachers reward them in their learning.	1. Teachers reward students who are active, creative, and well-mannered in learning. 2. The teacher punishes students who are not disciplined in the learning process.
4	Teachers held interesting and fun activities in learning	1. Using various methods/models of education following the learning objectives 2. Varying in the learning process 3. Doing ice breaking 4. Using technology that goes into learning
5	Evaluate and comment on learners' work/learning outcomes	1. Teacher evaluates learning activities 2. Teachers assess affective, cognitive, and psychomotor aspects 3. Teachers provide feedback/comments on the work/learning outcomes of the learners

(Manizar, 2017; Nurafrianti et al., 2020)

Data analysis is done quantitatively by calculating the average and percentage of the data obtained. In descriptive research, quantitative analysis can be used using rates, standards, or other statistical analyses. The data processing results are then presented in the form of tables or diagrams (Nassaji, 2015; Riastini et al., 2021).

3. RESULT AND DISCUSSION

Result

The results showed that elementary teachers had increased students' learning motivation during the online learning process. The results of this study will be grouped into several aspects: First, the stimulation aspect of learners through various variations. Second, the stimulation aspect of learning participants through classroom management. The third was the simulation aspect of learning learners through assessment. Fourth, the teacher's gender towards the stimulation of learners' learning. Fifth was

the ownership of educator certificates to the learning activities of learners. Sixth, the age of the teacher towards the motivation of learning learners. First, the aspect of stimulation of learners through variation, observed indicators were variations in media use, rewards and punishment, learning processes, and the use of technology. The percentage of questionnaire results of aspects of stimulation of learners through variation can be seen in Table 2.

Table 2. Percentage of Aspects of Stimulation through Variation

No.	Indicator	Result (%)				
		SB	B	C	K	TP
1	Media Variation	0%	55%	45%	0%	0%
2	Variations of Reward and Punishment					
	Giving Positive Words	36%	64%	0%	0%	0%
	Giving Appreciation of Student Work	27%	64%	9%	0%	0%
	Rewarding Active, Creative, Well-Mannered, and Disciplined Students	9%	36%	55%	0%	0%
	Punishing An Undisciplined Student	0%	36%	64%	0%	0%
3	Variations in the Learning Process					
	Using Model/Method	0%	18%	73%	9%	0%
	Using Innovative Learning Media	0%	27%	64%	9%	0%
	Doing Ice Breaking	0%	36%	64%	0%	0%
4	Variations in the Use of Technology	0%	9%	82%	9%	0%

Referring to table 1, teachers, in general, have made several efforts to motivate students through a wide variety. However, these efforts were dominant in the category enough for aspects of learning processes, the use of technology, and the provision of reinforcement. During the online learning process, teachers had not stimulated learners' motivation through variations to the maximum. Second, the aspect of stimulation of student learning through classroom management was observed. The element was that the teacher stimulates the student's learning desire through various activities, delivers things needed during the training, and guides if students experience obstacles. The percentage of aspects of stimulation of learners through classroom management can be seen in Table 3.

Table 3. Percentage of Stimulation Aspects through Classroom Management

No.	Indicator	Result (%)				
		SB	B	C	K	TP
1	Stimulate Students' Learning Desire	9%	82%	9%	0%	0%
2	Delivery of Things Needed in Learning Activities	27%	64%	9%	0%	0%
3	Guiding and Guiding Students Who Are Experiencing Obstacles	9%	82%	9%	0%	0%

The table above showed the tendency of teachers to motivate students through more dominant classroom management on good score choices. That was, the role of teachers was to encourage students through classroom management to get a good average score. Third, the aspect of student learning stimulation through assessment, the indicators analyzed were teachers conducting evaluations, conducting evaluations of three elements of student ability, and giving feedback/comments. The percentage of stimulation through assessment can be seen in Table 4.

Table 4. Percentage of Aspects of Stimulation through Assessment

No.	Indicator	Result (%)				
		SB	B	C	K	TP
1	Conducting an Evaluation	0%	82%	18%	0%	0%
2	Assessment of Affective, Cognitive, and Psychomotor Aspects	0%	91%	9%	0%	0%
3	Provide Feedback/Comments	0%	91%	9%	0%	0%

The above data showed that the tendency was the stimulation of learners' learning through very dominant assessment of good choices and none on very good decisions. Teachers have tried to motivate students through reviews with good average scores. Fourth, the results of the calculation of scores between

male teachers with female teachers, certification teachers with non-certification teachers, and young teachers (< 40 years old) with old teachers (> 40 years) can be seen in Table 5.

Table 5. Teacher Score as Motivator reviewed from Gender, Educator Certificate, and Age

Aspects	Viewpoint					
	L	P	S	N	M	T
Media Variations	3,57	3,5	3,6	3,5	3,5	3,6
Variations of Reward and Punishment	3,82	3,94	3,95	3,78	3,78	3,95
Variations of Learning Process	3,29	3,08	3	3,37	3,37	3
Variations of Technology	3	3	2,8	3,17	3,17	2,8
Stimulation through Classroom Management	4	4,17	3,93	4,17	4,17	3,93
Stimultion through Assessment	3,81	4	3,8	3,94	3,94	3,8
Average	**3,58**	**3,61**	**3,51**	**3,65**	**3,65**	**3,51**

Information: Male (L), Female (P), Certification (S), Non-Certification (N), Young Teacher (M), Old Teacher (T), Maximum Score = 5

Judging from the table above, there were some differences in the role of teachers as motivators when viewed from the point of view of gender, ownership of educator certificates, and the age of teachers. The score of the role of the teacher as a motivator was higher in female teachers than in men. Similarly, in the age point, young teachers (< 40 years old) have a higher average score as a motivator than teachers who were old (> 40 years old). However, the opposite happens to review the ownership of educator certificates. Teachers who do not have a certificate have a higher average score as motivators than teachers who already have an educator certificate. Overall, the comparison of teachers as motivators was viewed from the point of view of gender, ownership of educator certificates, and the age of teachers can be seen in Figure 1.

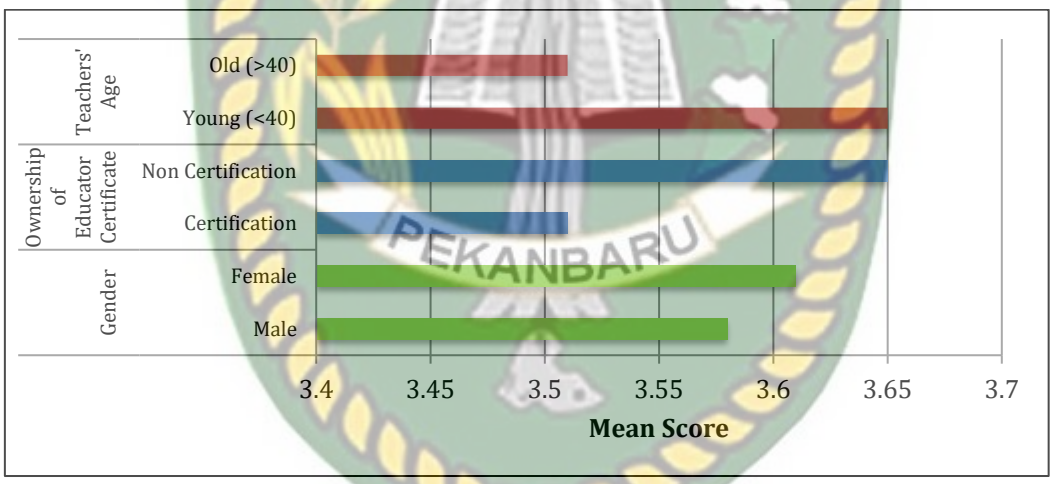

Figure 1. Teacher Score Comparasion

Discussion

If reviewed in general, teachers in elementary school have made various efforts in improving students' learning motivation during online learning. Most had obtained good scores, namely motivating classroom management and providing inspiration through assessment. One example of teacher efforts made in managing the classroom was giving various perceptions such as relevant images, voice notes, and questions that trigger students to learn through the WhatsApp group. Likewise, teachers guide learning activities and pay more attention to students who experience obstacles in tasks or discussions. With intensive interaction in the form of discussions and voice notes between teachers and students, it will give students a sense of satisfaction when participating in the online learning process, which will increase student learning motivation (Blaine, 2019; Liu & Chiang, 2019). This means that the greater the attention given by teachers and the more intensive interactions between teachers and students during online learning will have a positive impact in increasing student learning motivation (Blaine, 2019; Liu & Chiang, 2019; Rahman et al., 2020). Then, in providing stimulation through assessment, teachers have made efforts such as giving grades or comments on tasks that students have done and giving pictorial stickers or stars for active discussions. The method of assigning tasks and meetings through the WhatsApp group is considered effective in the conditions of the Covid-19 pandemic (Juliawan et al., 2021; Susilawati & Supriyatno, 2020).

Likewise, the utilization of WhatsApp in learning activities is also seen as effective to motivate students in learning, and it's just that it all depends again on its users as the situation and environment (Juliawan et al., 2021; Misaghi et al., 2021).

But on the contrary, on motivating variation, teachers tend to score in good categories. The dominant score was enough to be obtained on indicators providing variations in reward and punishment, innovative models/methods/media, ice breaking and variations in the use of technology. The reward and punishment that teachers have done were still limited to giving pictorial stickers. There were several reasons behind the low score on this aspect, namely the difficulty of granting awards and penalties due to limited distance and time in online learning, difficulty organizing and conditioning students to learn at home, difficulty developing education following the steps of the learning model, and Teachers were not used to developing learning media, both physical media and digital media. In the process of online learning, the trend was that there are still many teachers in the education unit who are not yet adept at utilizing information technology, the internet, and social media as a means of learning (Juliawan et al., 2021). This was because the teacher board is not used to and has not been trained to use the available devices or facilities.

Unlike the offline learning process, online learning has its difficulties for teachers: First, difficulty regulating and conditioning students' readiness in education because students are at home without direct supervision by the teacher (Asmuni, 2020; Natsir, 2021). Second, the constraints of online learning support facilities in students (some students and parents do not have smartphones) (Asmuni, 2020; Putri & Suyadi, 2021; Widikasih et al., 2021). Third, there was a misunderstanding of information conveyed through online applications, so students could not capture the material or messages given (Asmuni, 2020; Fadilla et al., 2021). Not only that, the Covid-19 pandemic came suddenly, resulting in teachers and students being surprised by the adaptation of learning from offline to offline patterns (Natsir, 2021; Rosyidiana, 2021). Teachers and students are equally unprepared for the online learning process, resulting in not running optimally.

When viewed from the gender role of teachers, female teachers are superior to male teachers in terms of increasing student learning motivation. Female teachers are more active at the learning time than male teachers (Diana & Mampouw, 2019; Wangid, 2021). In addition, the pedagogical knowledge of female teachers looks superior to that of male teachers (Diana & Mampouw, 2019; Gong et al., 2018). Female teachers have a higher sense of self-efficacy than male teachers (Wangid, 2021). Female teachers have a meek maternal nature, and female teachers are said to be more sensitive to understanding a student's feelings and conditions than male teachers (Muhasanah, 2021). But on the other hand, male teachers tend to be more friendly with their students and have a more assertive attitude, making it easy to discipline students (Majzub & Rais, 2010).

When viewed from the ownership of educator certificates, teachers who do not have educator certificates act more as motivators than teachers who already have educator certificates. Previous studies have found the opposite. Teacher certification has a strong relationship with the level of discipline teaching teachers in SD Negeri 008 Tembilahan Hulu, with a percentage of 90.29% (Juwita & Yudhyarta, 2020). The link between teacher certification and the quality of teaching elementary teachers is relatively high. The coefficient of teacher certification determination with the quality of teaching teachers in SD Complex IKIP Makassar Negeri is 0.678. Teacher certification affects the teaching quality of teachers of SD Negeri Kompleks IKIP Makassar City with a percentage of 67.8% (Hasmiah, 2020). Ownership of educator certificates will affect self-competence (Koswara & Rasto, 2016; Tjabolo & Herwin, 2020). The teacher professional educator certificate program (PPG) aims to improve the professionalism of an educator and re-emphasize the four competencies of teachers comprehensively to educators (Suratman et al., 2020; Zulfitri et al., 2019). Graduates of this program have been categorized as professional teachers.

Unfortunately, this study showed the result inversely proportional to the effects of previous studies. Some of the reasons that cause the average teacher score that has an educator certificate was lower than the average teacher score that has not an educator certificate were: First, teachers who have received educator certificates were mostly in the age range that is quite old, the average age of teachers who have had a certificate of education is above 45 years. Second, teachers who were old enough have a fairly low awareness and adaptability to technology. Third, the physical condition of the old teacher was no longer primed. Fourth, the quiet competence of elementary teachers who already have an educator certificate can be caused by several things, namely the heavy workload of teachers and so many administrative tasks that must be completed (Muhbar & Rochmawati, 2019; Riastini et al., 2021), as well as the lack of optimal teacher working group (KKG) that should be able to develop the competence of teachers in schools (Riastini et al., 2021). One study reveals that the competence of teachers who already have an educator certificate was in a good category. However, teachers who already have an educator certificate still have limitations on

technology development, model selection, methods, and learning media following the times (Susilaningsih, 2013).

Furthermore, teachers with a young age play a role in increasing students' learning motivation and providing stimulation in the learning process compared to teachers in old age. Teachers with the age group 7 (50 - 54 years) and group 8 (55 - 59 years) experienced a decrease in pedagogical competence and professional competence (Winarni & Lismadiana, 2020). The closer to retirement age, the less excited teachers will be. According to the ILO and WHO (Winarni & Lismadiana, 2020), work productivity will decrease with age. 24 - 40 years old is the age which teachers will explore and expand the ability to practice all the intellectual potential, talents, interests, knowledge, and skills that have been acquired in college so that young teachers are more adaptable to the development of science and technology (ICT) (Lawrence & Tar, 2018; Palupi, 2015). The curiosity of young teachers is very high, and the physical condition and spirit of young teachers are still very good. Senior teachers who have had long teaching experience and age that enter the old phase tend not to be able to use technology in the learning process, so less can create meaningful learning in the online learning process (Juliawan et al., 2021). The findings in this study only represent the role of teachers as motivators in SD Negeri 1 Pohsanten. This was a limitation of this research.

4. CONCLUSION

Elementary teachers had increased student motivation during online learning, with a good dominant score. However, unfortunately, some aspects are still in the category of enough, namely on the indicator of reward-punishment, aspects of variation in the learning process, and aspects of the use of technology. When viewed in terms of gender, female teachers are superior to male teachers. In terms of ownership of educator certificates, non-certificate educator teachers are foremost to teachers with educator certificates. While in terms of teacher age, young teachers are superior to old age teachers. The thing was caused by several factors: age, technology mastery, teacher workload, and not yet optimally teacher working group (KKG). The findings in this study are expected to be used as a reference in increasing the ownership of teacher competence in online learning. Stakeholders were expected to pay attention to and improve the professional education process (PPG). Teachers who already had an educator certificate mastered four teacher competencies and 21st-century learning skills. Teachers were also expected to improve their competence through various activities such as seminars, workshops, or training related to developing teacher skills as motivators. Teachers can also engage a wide range of students' environmental, social, and cultural potentials to motivate students to learn.

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Exploration of the Use of Quizizz Gamification Application: Teacher Perspective

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ABSTRAK

Perkembangan teknologi TIK telah berdampak pada perkembangan industri game, yang membuat guru lebih kreatif dalam merancang proses pembelajarannya. Namun, guru belum sepenuhnya melaksanakan proses pembelajaran dengan menggunakan media berbasis gamifikasi. Penelitian ini bertujuan untuk mengeksplorasi perspektif guru tentang penggunaan aplikasi gamifikasi Quizizz. Jenis penelitian ini yaitu kualitatif. Subjek penelitian yang digunakan yakni terdiri 16 guru kelas dari 5 sekolah dasar. Alat pengumpulan data hanya menggunakan wawancara secara struktur kepada guru kelas. Teknik yang digunakan untuk menganalisis data yaitu analisis deskriptif kualitaf dengan menggunakan Miles dan Huberman. Hasil penelitian menunjukan bahwa penggunaan gamifikasi khususnya Quizizz sangat bermanfaat dan mendukung para pendidik dalam pembelajaran. Namun banyak pendidik yang mengakui memiliki hambatan: mulai belum mengenal sistem gamifikasi; kesulitan dalam pembuatan gamifikasi; belum adanya pelatihan dan sosialisasi serta pendidik tidak mengetahui fungsi kelebihan dan kelemahan gamifikasi itu sendiri. Tantangan dan hambatan tersebut tentu memerlukan adanya dukungan dari stakeholder yang terkait. Implikasi penelitian ini bertujuan untuk memperbaiki potensi kelemahan pendidik guna menjadikan pendidik sesuai di abad ke-21.

ABSTRACT

The development of ICT technology has an impact on the development of the game industry, which makes teachers more creative in designing their learning processes. However, teachers have not fully implemented the learning process using gamification-based media. This study aims to explore the teacher's perspective on the use of the Quizizz gamification application. This type of research is qualitative. The research subjects used consisted of 16 classroom teachers from 5 elementary schools. The data collection tool only uses structured interviews with classroom teachers. The data analysis technique uses a descriptive qualitative analysis using Miles and Huberman. The results show that using gamification, especially Quizizz, is beneficial and supports educators in learning. However, many educators admit that they have obstacles: they are unfamiliar with the gamification system, have difficulty in making gamification, have no training and socialization, and educators do not yet know the function of the advantages and disadvantages of gamification itself. These challenges and obstacles certainly require the support of the relevant stakeholders. The implication of this research is to improve the potential weaknesses of educators in order to become exemplary educators in the 21st century.

1. INTRODUCTION

The learning process, in general, requires students to listen and take notes but requires students' activities in thinking and building a communicative atmosphere (Hill et al., 2020; Mahmoud et al., 2020; Suryawati & Osman, 2018). The strategy aims to improve students' thinking skills to acquire knowledge that they construct themselves (Lapitan et al., 2021; Palaniappan et al., 2022; Shishigu et al., 2018). One of the student learning successes is determined by the teacher as an educator. Suppose you believe that knowledge must be built individual who learns. In that case, learning is very different from traditional learning, which assumes that knowledge is in the teacher's head and the teacher must transfer the way to share that knowledge with students. The use of various learning media can support student learning success (Azizah et al., 2017; Haryadi & Pujiastuti, 2020; Muswita et al., 2018). One of the exciting learning media with an interactive nature that prioritizes cooperation communication and can lead to interaction between students is games, which create motivation in learning, namely fantasy, challenges, and curiosity.

The impact of the Covid-19 pandemic requires teachers to support the implementation of the learning process through online media (Rahmatsyah & Dwiningsih, 2021; Suprayogie & Hakim, 2021). Thus, this requires teachers to take advantage of innovative, effective, and efficient learning media so that learning

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continues to the maximum. The integration between technology and learning methods encourages teachers to be able to fulfill competencies, namely teaching several skills, including life and career skills; learning and innovation skills; information media, and technology skills (Budiaman et al., 2021; Muhdi & Nurkholis, 2021; Nugraha & Widiana, 2021). Therefore, teachers must provide students with an education that encourages critical, constructive, innovative, and character thinking skills (Russo et al., 2021; Tambak et al., 2021; Toropova et al., 2021). In conclusion, this is a challenge for teachers to continue to crexcitingnteresting and active learning and still achieve learning goals.

The development of ICT technology has impacted the development of the games industry, which makes teachers more creative in designing their learning process. Gamification is a rapidly growing trend in education because it influences learning (Eugenia et al., 2013; Hatlevik et al., 2018; Orhan Göksün & Gürsoy, 2019).Gamification can encourage motivation and increase students' participation in stimulating their desire (Lopez & Tucker, 2019; Orhan Göksün & Gürsoy, 2019). Previous research explains that gamification can make students' learning more engaging and positive (Groening & Binnewies, 2019; Lopez & Tucker, 2019). Lack of student motivation when online learning occurs (Adukaite et al., 2017). Traditional strategies alone are not enough to be able to provide a solution; by realizing modern and active learning, educators are advised to use gamification as an effective means of increasing student engagement and motivation in online education (Sousa-Vieira et al., 2016). Gamification depicts the connection between games and non-game concepts and is applied to non-game contexts such as education (Campbell et al., 2017; Deterding et al., 2011). Gamification aims to change game elements into the real world without changing the essence (Arkn Kocadere, 2015). Gamification is relevant to the description of 21st century learning to support students and develop critical thinking skills, is more entertaining, and increases students' motivation in learning Gamification is designed to have in-game elements such as rankings, transparent scores, and badges to lead to rewards for achieving the targets achieved (Clarisó et al., 2017).

Learning by using gamification is becoming popular in educational development to enrich the student experience in the classroom (Palaniappan et al., 2022; Rose et al., 2016). Game-based learning refers to achieving specified learning outcomes through game content and play and enhancing learning by involving problem-solving spaces and challenges that give the learner a sense of accomplishment (Groening & Binnewies, 2019; Marti-Parreño et al., 2016). Quizizz is an application designed to help the game-based learning process in an online quiz. This application acts as a tool for students' self-assessment or for measuring material understanding for student improvement (Ismail & Mohammad, 2017). The Quizizz application applies an educational concept and has exciting features such as avatars, leaderboards, and attractive themes as if playing in a game and can provide a fun interactive experience (Wijayanti et al., 2021; Zuhriyah & Pratolo, 2020).

The teacher does not fully implement the learning process using gamification-based media. Teachers do not yet have an awareness of providing gamification-based learning in their assessments. This is because they are still worried about whether students can accept the gamification platform or not (Ab. Rahman et al., 2018). This research is essential to explore educators' knowledge related to gamification learning, one of which is the quizizz application that is currently trending; therefore, the hope is to correct difficulties and shortcomings in using quizizz applications. This study focuses on educators' views regarding gamification-based applications, needs, obstacles faced, and application in elementary schools. This study aims to explore the opinion of educators about the idea of gamification-based learning media, namely Quizizz. The contribution of this research is expected to be able to provide recommendations regarding the potential use of gamification applications widely in the context of education to achieve the desired learning objectives.

2. METHOD

This type of research is qualitative research to provide an overview and explanation of the teacher's perspective in using the quizizz application to support online learning during the Covid-19 pandemic. The data collection technique uses structured interviews with a population of 40 teachers with a sample of 16 teachers from 5 elementary schools in the Sragen Regency. This research uses a case study research design. The data was collected through in-person interviews with respondents. After the data is collected, the information is displayed proportionally. Then analyzed using an inductive model; This model is intended to clarify the process of reducing data to create meaning from the raw data that has been collected. These findings were obtained to interpret basic information.

Researchers used Milles to analyze data in this study (Milles et al., 2014). First, data reduction (selecting and focusing, and changing the data obtained from the bracket. In this study, only data consisted of in-person interviews. Then, the summary is made more accessible to analyze the data and proceed to the next step. Second, the display of data (displaying organized and compressed data from the information set

so that it can be concluded later, In this step, the researcher shows or displays the data according to the data that has been prepared. Obtained and presented sequentially. Finally, after completing the data reduction and displaying the data obtained, the researchers concluded the findings in the field and based on the research problem. The distribution of the sample is presented in Table 1.

Table 1. Sample distribution

Name of school	Number of samples
SD Negeri Karantengah 1	4
SD Negeri Karangtengah 3	4
SD Negeri 15 Sragen	4
SD Negeri Mojomulyo 2	2
SD Negeri sine 3	2
Sum	**16 Sample**

The instrument used is an open questionnaire that leads to the teacher's understanding of the advantages, disadvantages, and difficulties of using the Quizizz application and whether this application supports the assessment of students in school. Data analysis used is qualitatively transcribed analysis. Test the validity of the instrument using construct validity. The question items presented are as follows: (1) Do you know about the quizizz application and its importance in supporting the learning process?, (2) Do you have difficulty creating quizizz applications and their application in the classroom?, (3) Do you know the advantages and disadvantages of the quizizz application?, (4) What materials do you need to support learners' assessment using the Quizizz application?, (5) Has quizizz application training ever been applied in your school?. The technique used to analyze the data is descriptive qualitative analysis.

3. RESULT AND DISCUSSION

Result

Easy-to-operate software is one of the crucial factors in increasing students' learning interest. The success of the online learning process is a one-way and two-way model, one of which is determined by the use of technology providers of interaction services between teachers and learners. The means that support these interactions in online learning are provided by many digital platforms with various completeness by the purpose of the exchange to be achieved. Quizizz itself is an educational game application that is narrative and flexible; in addition to conveying material, Quizizz can also be used as an exciting and fun learning evaluation media. Data from interviews with 16 teachers in Sragen Regency showed that teachers understood the importance of using the Quizizz application in learning; they realized that gamification-based learning media could support online learning so that students do not feel saturation. Teachers argue that smartphones or gadgets to help learn to require additional applications so that the learning and assessment process can still be carried out effectively and efficiently even though it is carried out remotely. Quizizz is considered to help judge students more realistically because students cannot cheat on fellow friends. After all, the questions given to students with each other have been randomized. Problems can be made with a specific time provision that makes students do not have the opportunity to ask questions to people around or look at their notebooks. In addition, students can find out the rankings he gets from all students who work on the question and know the correct questions and answers from the questions he has done.

Another advantage of Quizizz for teachers is that there will be automatic grading. The quiz creates a question item analysis, all of which can be downloaded in the form of excel files. The report presented is quite detailed; each student will be reported the answer is entirely wrong and the percentage of quiz achievement for all students. In addition, the quiz results of each student can be emailed to the student's parents. This will undoubtedly make it easier for teachers to get feedback quickly. But in its implementation, the Quizizz application cannot be utilized optimally due to obstacles. Perceived obstacles include teachers having difficulty in implementing applications. This difficulty is because not all students have devices that can support the use of this application. Internet network difficulties and the high cost of internet quota are why this application is difficult to implement in distance learning. Teachers prefer to use WhatsApp media in giving tasks, namely by sending files, and then the results are sent in the form of photos and a collection of assignment books. The lack of training related to the use of applications such as Quizizz among educators is one of the reasons for the lack of maximum utilization of this application in online learning. Teachers tend to choose more accessible and more familiar ways to use.

Discussion

Gamification is nothing new in educational contexts, even before the application of game-based education was created (Darejeh & Salim, 2016; Dichev & Dicheva, 2017).The purpose of gamification education in the educational context is motivation and being able to engage learners, improve skills and change negative behavior in the learning and learning process (Malamed, 2012; Seaborn & Fels, 2015). But gamification is not without its pros and cons. Some literature explains that most of the negative impacts are related to the design of such gamification (Dichev & Dicheva, 2017; Toda et al., 2019). It is precisely this that the use of education-based gamification needs to be reviewed to determine the educator's perspective regarding gamification and whether it is acceptable.

The observations found that most educators already know about the benefits of using the Quizizz application in game-based digital learning or so-called gamification. The advantage of gamification is that it makes learning fun through friendly competitions, challenges, and rewards, making it an excellent means of encouraging student engagement in learning (Hamari et al., 2016; Xu et al., 2022). It helps learners develop critical thinking and multi-task skills (Ding et al., 2018; Sajinčič et al., 2022). In addition, gamification provides a source of data related to student learning, thus ensuring more effective, precise, and timely information for teachers, parents, administrators, and public policymakers (Rincon-Flores et al., 2022; Zainuddin, 2018). But only a tiny percentage of teachers use media in student learning. This is because the definition of the use of names is confusing to the educational domain. After all, most gamification does not associate the word with education (Chow et al., 2020; Hakak et al., 2019; Toda et al., 2019). Then it is also related to the results of research that show that there is no socialization and training associated with the use of quizizz or gamification then, which makes educators do not know that there is a game-based digital platform. However, educators must encourage themselves and adjust to the development of the increasingly wallowing times. It is relevant to the profession of educators who continuously require special knowledge and skills; the educator profession is also required to have competencies from various fields that will support the learning and learning process in the class. So it is essential to obtain these competencies through training organized by the relevant government or local stakeholders. Educators should be given training before starting teaching professionally (Richter et al., 2021).

Further research analysis found that most educator respondents had difficulty making gamification-based learning or Quizizz and its application in class. This is because factors influence challenges in making, namely, poorly designed. After all, gamification is not designed according to user demographics, behavioral profiles, learning activities, and gamification strategies (Klock et al., 2016; Toda et al., 2019). Most existing frameworks have no empirical evidence of their use, thus inhibiting the adaptation of educators in their creation and application (Jaeger & Adair, 2017; Pedreira et al., 2015). In addition, Quizizz or gamification provides different definitions of feedback on the same concept so that later it will confuse educators as makers and learners as the intended subject (Wongso et al., 2014). The availability of inadequate infrastructure is one of the reasons for the occasional use of this application. Infrastructure issues negatively impact student participation in doing quizzes (Orhan Göksün & Gürsoy, 2019).

Various studies on using the Quizizz application, showing the benefits obtained, illustrate that Quizizz can improve each student's competence and skills. Quizizz learning media is one of the efforts to accommodate learning media problems in Indonesia that cannot be applied conventionally with other learning based on Informatics and Computer Technology. The technology-based educational learning model can be strategy narratively, that is, perspective. Thus, generating a formulation of problem-solving efforts through the Quizizz application. To create a livelier learning atmosphere, the Quizizz application can be an effort without removing the essence of the teacher's material. Quizizz games can help drive students' learning motivation and improve learning outcomes (Deterding et al., 2011; Hughes-Gay et al., 2021; Seaborn & Fels, 2015). Student involvement is ever conclusive, behavioral, and emotional. It is also strengthened gamification system or quizizz has an impact on characteristic psychological which is effective to cause changes in behavior bai learners later (Landers, 2019). Quizizz improves learning performance through friendly competitions (Orhan Göksün & Gürsoy, 2019). This enthusiasm and excitement also lead students to greater engagement and enhance learning performance. Students have fun and enjoy participating in competitive activities. These positive feelings are considered emotional engagement. This implies exciting activities within the Quizizz app, not only in the form of scores, points, and leaderboards that meet the spirit of the competition but also funny images or memes that appear after each answer is right or wrong, making the quiz even more enjoyable. In addition, memes, avatars, themes, and music are also available on this platform to make learning more fun and interesting, and students feel enthusiastic and emotionally engaged. Those who are not interested in music can also sound the device individually according to their needs.

When connected and supported by previous research, it is stated that the use of quizizz application learning media can improve several aspects of students. Students and teachers feel the positive benefits presented in the application. In addition, the use of quizizz application learning media can give an active response between students in competing to trigger students to learn better (Wijayanti et al., 2021). The differences found in some previous studies are in the subject of the study. The issues of prior research are students in high grades, so their capture power is easier to use and operate the Quizizz app. While in this study, the subjects were students in low grades who still needed guidance and assistance from parents. As for the implications of this study, in addition to making the learning atmosphere fun and active, teachers are facilitated in evaluating students' understanding of the given material. Students can also train themselves by answering quizzes in various ways already available on the application. In addition, the Quizizz application can be used as a problem bank by teachers in training students' intellectual abilities to support their cognitive development. The limitation in the implementation of this study is that it only examines the educator's view of the use of the Quizizz application has not concerned with the use of applications from student perspectives. So the difficulty of using the application and how much this application affects the motivation of learning large students is not yet known. Therefore, it is recommended that research that concerns the validity of aspects of using the application by both teachers and students cannot control and guide students who have difficulty operating the Quizizz application face-to-face.

4. CONCLUSION

Overall, the use of gamification, especially Quizizz, is considered very useful and supports educators in the learning and learning process and is deemed relevant to the development of the digital revolution era in the 21st century. But the fact is that many educators who recognize many obstacles are not familiar with the gamification system; difficulties in the manufacture of gamification; there is no training and socialization, and educators do not know the function of the advantages and disadvantages of gamification itself. These challenges and obstacles certainly require the support of relevant stakeholders.

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Basic Science Module as a Resource for Independent Learning for Elementary Teacher Education Students in the Pandemic Covid-19

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ABSTRAK

Kurangnya media pembelajaran dalam pembelajaran daring membuat mahasiswa kesulitan dalam belajar khususnya pada materi konsep dasar IPA. Alternatif solusi agar mahasiswa dapat belajar mandiri yaitu dengan mengembangkan modul dengan karakteristik modul yang baik. Penelitian ini bertujuan untuk menghasilkan produk berupa modul konsep dasar IPA yang valid sesuai dengan karakteristik modul yang baik. Jenis penelitian ini merupakan penelitian research and development dengan prosedur pengembangan Borg & Gall. Subyek penelitian ini adalah tiga orang ahli ilmu penilaian, satu orang ahli evaluasi. Populasi dalam penelitian ini adalah siswa prodi keguruan SD yang mengambil mata kuliah IPA, dan sampel penelitian ini adalah 9. Teknik pengumpulan data dalam penelitian ini dilakukan dengan menyebarkan angket dan lembar validasi produk. Teknik analisis data dilakukan dengan teknik analisis deskriptif kualitatif dan kuantitatif. Hasil penelitian ini menunjukkan bahwa modul IPA yang dikembangkan memiliki karakteristik have a clear instruction, self-contained, stand-alone, adaptive, user-friendly dengan kegrafian yang menarik. Hasil validasi modul diperoleh rata-rata 103 dengan kategori sangat baik. Berdasarkan hasil angket respon yang telah disebarkan kepada sepuluh mahasiswa diperoleh data bahwa sebanyak 80% mahasiswa menyampaikan sangat membantu memandirikan belajar selama masa pandemi, dan sebanyak 20% menyampaikan bahwa modul yang dikembangkan cukup membantu dalam pelaksanaan proses pembelajaran selama masa pandemi. Hal tersebut membuktikan bahwa modul yang dikembangkan ini layak untuk digunakan sebagai sumber belajar mandiri di masa pandemi.

ABSTRACT

The lack of learning media learning that dares make students find it challenging to learn, especially on the basic concepts of science. An alternative solution for students to learn independently is by developing modules with good module characteristics. This study aims to produce a product in the form of a valid science basic concept module according to the characteristics of a suitable module. This type of research is research and development research with Borg & Gall development procedures. The subjects of this study were three experts in assessment and one evaluation. The population in this study were elementary school teacher study students who took science courses, and the sample of this study was 9. The data collection technique in this study was carried out by distributing questionnaires and product validation sheets. The data analysis technique was carried out using qualitative and quantitative descriptive techniques. The results of this study indicate that the developed science module has clear, independent, independent, adaptive, user-friendly instructions with attractive graphics. The module validation results obtained an average of 103, with a very good category. The results of the response questionnaire distributed to ten students showed that as many as 80% of students added that they were accommodating in independent learning during the pandemic, and as many as 20%. Based on the modules developed were pretty helpful in implementing the learning process during the pandemic. It proves that the module developed is worthy of being used as a source of independent learning during the pandemic.

1. INTRODUCTION

The covid pandemic period forces education to adapt to existing conditions, as well as learning carried out in higher education. Educators must be able to facilitate the needs of the learning process during this covid period as much as possible so that the learning process continues to run effectively and efficiently. Elementary school teacher education is a study program that produces qualified and characterized prospective teachers. The quality of these prospective teachers also greatly affects the learning process that

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will be carried out in the future. (Julie A. Luft & Peter W. Hewson, 2014; Nixon et al., 2019) also explined that a teacher's science materials knowledge also impact on the teachers' career.

However, the result of observations especially in natural science class, showed that the learning process during pandemic occurred leaning loss which resulted in students not understanding the concept of the basic concept of science. Students do not master the content of the material being taught. It is very dangerous because the quality of these prospective educators will also determine the quality of education in elementary schools in the future (Boonroungrut et al., 2022; Diva et al., 2021; Haryati et al., 2021). According to that need analysis, one alternative that can be developed by educators is by developing a module as a resource for student independent learning. One of the subjects that need independent learning resources in the module form is the elementary science basic concepts course. Science is an important part of education that plays a role in preparing students to have a critical, creative, and solution thinking attitude in solving problems that exist in everyday life (Afni et al., 2018; Ouahi et al., 2022; Tika & Agustiana, 2021). The existence of science in elementary school is also used as a means to nurture students' curiosity scientifically (Kasse et al., 2022; Nehru & Irianti, 2019). The importance of science requires the role that prospective teachers have good quality mastery of the science concept. This must be prepared since the prospective teacher becomes a student.

Not all elementary teacher education students come from science majors at the high school level, some come from social studies, language, culinary majors and some even come from tourism vocational schools. This will make it difficult for them to explore science material, especially with material that has numerical characteristics. Consequently, an alternative learning resource is needed that can make it easier for them to study the material in the basic science concept course (Aufa et al., 2021; Kimianti & Prasetyo, 2019; Rahmatsyah & Dwiningsih, 2021). Hopefully, this module can also be used as a tool for students to study independently according to their respective abilities with different time requirements. The learning process during pandemic the Covid-19 forced the learning system to be carried out online. This situation requires the learning resources support that make students independent in the learning process. The results of learning evaluations in the basic science concept course also show that learning will run effectively if it is assisted by complete learning resources, one of which is in the module form (Erawati et al., 2021; Herlina & Hadiyanti, 2021). Modules developed based on scientific topics will be very interesting and can develop students' skills in science education (Levrini et al., 2021). This situation shows that a valid module is needed that can help the online learning process with the purpose of students can study independently because the module can make students study anywhere and anytime. With a module, the learning process also runs effectively and efficiently because the material has been provided coherently. Based on these problems, it is very important to develop a module for basic science concepts as a source of independent learning for elementary teacher education students.

The module is teaching materials that are arranged systematically in a language that is easily understood by students, according to their age and level of knowledge so that they can learn independently with minimal guidance from educators (Prastowo, 2013; Wulandari et al., 2021). This module needs to be developed because the module has the following advantages. First, the module can provide feedback with the aim of students knowing their shortcomings and immediately make improvements (Dewi et al., 2017; Utami et al., 2018). Second, the module set clear learning objectives with the aim of student learning performance is directed in achieving learning goals. Third, module that is designed to be attractive, easy to learn, and can answer needs will certainly motivate students to learn (Buchori & Rahmawati, 2017; Winatha et al., 2018). Fourth, module is flexible because the module material can be studied by students in different ways and at different speeds (Kimianti & Prasetyo, 2019; Raharjo et al., 2017). Fifth, collaboration can be established because with the competition module can be minimized and between learners and learners. Sixth, remedies can be done because the module provides sufficient opportunities for students to be able to find their weaknesses based on the evaluation given. A module can also be used as a way to reduce student academic stress. Furthermore, the module can also be used as an alternative to support learning, especially during the Covid-19 pandemic (Islami & Armiati, 2020).

A module is said to be good if it fulfills the five-module characteristics, namely *have clear instruction, self-contained, stand-alone, adaptive, and user-friendly*, specifically described as follows. First, have clear instruction, students are allowed to learn independently and not depend on other parties (Aufa et al., 2021; Herawati & Muhtadi, 2018). Self-instruction can be fulfilled if the module contains clear learning objectives; learning material is packaged in small or specific activity units; examples availability and illustrations that support the presentation clarity of learning materials; there are practice questions, assignments; contextual; the simple language and communicative; there is a summary of learning material; the existence of an independent assessment instrument. Second, Self Contained, all required learning materials are included in the module. These characteristics provide the opportunity for students to study the learning material thoroughly (Fonda & Sumargiyani, 2018; Subarkah et al., 2021). Third, stand Alone, the module

developed does not depend on other teaching materials or does not have to be used together with other teaching materials (Astalini et al., 2019; Buchori & Rahmawati, 2017). Students do not need other teaching materials to study or do assignments in the module. Fourth, Adaptive, the module can adapt to the development of science and technology, flexible or flexible to use in various hardware (hardware) (Asmi et al., 2018; Raharjo et al., 2017). An adaptive module is if the module can be used for a certain period. (e) User Friendly (friendly or familiar), the module has simple instructions and information exposure is easy to understand and uses commonly used terms (Aufa et al., 2021; Fisnani et al., 2020). In addition to these characteristics, the module must also be developed according to the needs of students based on the results of a preliminary analysis questionnaire and an analysis of student needs regarding basic science concepts (Purwanto et al., 2020).

The module is also defined as part of a planned learning unit designed to help individual students achieve their learning goals. Other research found that students can learn according to their ability and provide opportunities for individual differences in learning (Linda et al., 2021; Syahroni et al., 2016). Other research also found that students who have high speed in learning will master the material faster and more independently. Meanwhile, students who have a low learning speed can learn again by repeating parts that have not been understood until understood independently (Astra et al., 2020; Darmayasa et al., 2018). The involvement of students with learning modules allows them to be independent. The availability of modules as teaching materials will make it easier for teaching and learning process activities, increasing students' intrinsic motivation, and increasing extrinsic motivation with lots of feedback (Bela et al., 2021; Mamun et al., 2020; Sari et al., 2020). There is no specific study regarding the basic science module as a source of independent learning for elementary school teacher education students during the covid-19 pandemic. This study aims to develop a basic science module as a source of independent learning for elementary school teacher education students during the covid-19 pandemic. It is hoped that the developed science module can help students learn.

2. METHOD

This research type is a research and development study, with the Borg & Gall development procedure. The procedure for developing a learning model in this study refers to the Borg & Gall model with the following stages: research and information collecting; planning, develop a preliminary form of product; preliminary field testing; main product revision; main field testing, operational product revision; operational field testing, final product revision, dissemination and implementation (Aka, 2019). In this research, the research is still at the fifth stage, namely the main product revision. Further research will be continued with the trial phase. It can be seen in this fishbone Figure 1.

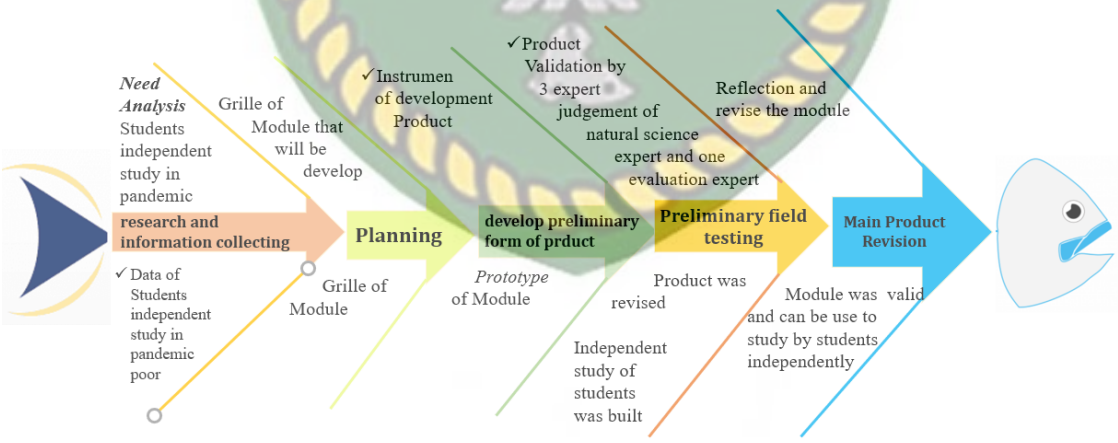

Figure 1. Stage of this research

The research subjects were three science experts of judgment, one evaluation expert, and students of the University of Sarjanawiyata Tamansiswa Yogyakarta. The population of this research is the student of elementary school teacher department who take the natural science class, and the sample of this research is 9 students of elementary school teacher department who take the natural science class. Data collection techniques in this study were carried out by distributing questionnaires and product validation sheets. The instrumen of validation sheet firstly validated by the evaluation expert and valid declared. The module development grid can be seen in the Table 1.

Table 1. The Module Development Grid

Aspects	Indicator
Material Aspect	1. Material truth 2. Material accuracy 3. The suitability of material with learning objectives 4. The suitability of material sources theoretically and empirically 5. Encouraging student learning independence 6. Encouraging student innovation 7. Able to motivate student self-development 8. The material novelty
Layout Aspect	1. Have a clear instruction 2. The module allows students to study independently 3. The learning objectives are presented 4. Material is packaged in small or specific activity units 5. Availability of examples and illustrations that support the clarity of the presentation of learning materials 6. There are practice questions, assignments, and the like contextually 7. The language used is simple and communicative 8. The module is equipped with a summary of the learning material 9. Self-contained: learning material contained in a complete module 10. *Stand alone:* the module developed does not depend on other teaching materials 11. *Adaptive:* the module is integrated with science and technology and is flexible 12. *User friendly: the module has simple instructions and information*
Graphics Aspect	1. Suitability of the module size with the level of student development and module material 2. Unity or harmony of appearance, layout module skin elements 3. The clarity and harmony of colors in the layout elements 4. The suitability of using letters and font sizes with the level of student development 5. The suitability of the illustrations used with the message conveyed

The data analysis techniques used in this development research were qualitative descriptive analysis techniques, quantitative descriptive analysis techniques, and inferential statistical analysis techniques. Qualitative descriptive describes the validation process of module involving three expert natural science experts and one evaluation expert. And quantitative descriptive describes the evaluation of four experts. This research was carried out in the elementary school education department of Sarjanawiyata Tamansiswa University.

3. RESULT AND DISCUSSION

Result

The result that has been achieved in this research is a product of the Basic Science Concept module consists of three themes, namely electricity and magnetism, natural resources, and the solar system. The developed module has characteristics, among others: *have a clear instruction, self-contained, stand-alone, adaptive, user-friendly, and interesting graphic aspects. The self-instruction* aspect is indicated by the function of the module which allows students to learn independently and not depend on other parties. This is evidenced by several indicators, including the developed module containing clear learning objectives. material packaging in the module is packaged in small or specific activity units. The module developed is also equipped with the availability of examples and illustrations that support the clarity of learning materials presentation. This is evidenced by the presence of pictures inserted in the module according to the material being studied. For example, when discussing static electricity, the module is given a picture explanation of the illustration of static electricity in everyday life. When discussing the sun, the solar system module is also equipped with a picture of the sun with a full-color display so that the explanation becomes easier to understand.

The module being developed is also equipped with practice questions, assignments, and the like suitable for the material being studied. This is used to measure student understanding in studying the module material. There are various types of evaluation questions, namely there are worksheets provided for each sub-chapter, and at the end of the module, there are questions that discuss the entire module. This

evaluation can be done individually anywhere and anytime because it is presented in the form of a soft file. Another characteristic of the developed module is *self-contained*. This aspect is evidenced by all the learning materials needed by students are contained in the developed module. This will make it easier for students to learn because they no longer need to look for other learning sources in studying the material. The third characteristic of this developed module is Stand Alone. This is evidenced by the module being developed that does not depend on other teaching materials or other teaching materials with the intention of students do not need other teaching materials to study or do assignments on the module.

The fourth characteristic of this developed module is *adaptive*. This adaptive aspect is realized by a module that is developed to adapt to developments in science and technology, being flexible or flexible to use in various hardware devices. The developed module is designed with two types, namely hard file and soft file, this makes it easier for students to study anywhere and anytime, the worksheet is also presented with the file by first downloading the file link that has been provided. The fifth characteristic of this developed module is *user friendly*; the developed module has simple instructions and information exposure is easy to understand, and uses commonly used terms. The sixth characteristic that this development has is its interesting graphic aspect. This aspect is evidenced by the developed module which is designed in full color, colorful and attractive covers, and various visualizations of images that follow the material discussed. The results of the development of the science module are presented in Figure 2.

Figure 2. Natural Science Module

Assessments given by experts on the material aspect get very good qualifications. In the aspect of layout get very good qualification. on the graphic aspect get very good qualifications. The module developed was then assessed by 3 science experts' judgments. The results of this assessment in the Table 3.

Table 3. The Results of the Three Experts' Assessment of the Developed Modules

Aspects		Experts		
Material Aspect		27	35	34
Layout Aspect		43	51	48
Graphics Aspect		25	24	22
	Total	**95**	**110**	**104**

After being validated, the developed module was also asked to respond to ten students who took the basic science concept cours. Based on the results of the response questionnaire that has been distributed to ten students, data shows that as many as 80% of students say that it is very helpful to learn independently during the pandemic, and as many as 20% say that the modules developed are quite helpful in implementing the learning process during the pandemi. The responses given by students include the modules developed can help students become independent because the developed modules present material clearly, concisely, densely and easily understood. the arrangement of the material is also structured, detailed and attractively designed so that it is also interesting to read.

Discussion

The module validity data above shows that the module developed is valid or feasible to be used as a source of independent learning for elementary school teacher education study program students during the pandemic. This module is also one of the solutions to achieve learning objectives in the basic science

concepts course. Furthermore, success in the process of learning basic science concepts also affects the quality of human resources of prospective elementary school teachers. One aspect that teachers need to pay attention in the future teachers is the mastery of knowledge, including knowledge of basic science concepts (Rowan et al., 2020; Sosibo, 2012). At the module validation stage, some of the input from the validator team, among others, was related to the layout of the worksheets and questions that were not yet HOTS. The questions were then made into HOTS with C4 ability, namely to analyze. The activity of analyzing has two levels, the first level is analyzing incoming information and arranging the information into smaller parts to identify patterns of relationships. Second, being able to recognize and differentiate complex cause and effect scenarios. Third, identifying or formulating questions. The second is the evaluation level. Analysis level indicators are: providing an assessment of solutions, ideas, and methodologies using appropriate criteria or existing standards to ascertain their effectiveness or usefulness; making hypotheses, criticizing, and testing; accepting or rejecting statements based on predetermined criteria. While the third is the level of creation. The level of creation indicators are: generalizing an idea or perspective about something; designing ways to solve problems; and arranging elements or parts into new structures that have never existed before (Mubarok & Anggraini, 2020).

Based on the six characteristics of the developed module in this research, it can help students learn the material in the basic science concepts course as well as a step to reduce academic stress and streamline learning during this pandemic. Its inline with the research which has been done by (Priantini & Widiastuti, 2021). Independence is very important and an attitude that must be owned by every individual. Independence is defined as the ability to manage everything one has, such as time, thinking skills accompanied by the ability to take risks and solve problems hand (Nurhasanah et al., 2020; Sugianto et al., 2020; Syelitiar & Putra, 2021). Independent, which is meant in this study, is a student's attitude that is manifested through activities of responsibility for the rights and obligations of being a student in the learning process of basic science concepts, not paying attention to dependence on others, being able to show great curiosity and having a confident attitude. This module can also be used as an alternative learning solution during a pandemic (Mazidah et al., 2020; Purnamasari et al., 2020).Various readiness technologies are very useful during this pandemic (Andarwulan et al., 2021; Gestiardi et al., 2021).

During the Covid pandemic like this time is the most appropriate time to foster an independent attitude in learning. This independent attitude needs to be built by each individual, one alternative that can be done in developing independence is through the learning process. The pandemic situation requires students to use emotional intelligence so that they can manage boredom and negative impacts. The module provides an opportunity for students to cultivate their emotional intelligence by self-regulating, more responsibility for learning outcomes. Active participation of students in the learning process, both in determining plans, strategies, goals, and controlling their learning by using the module as a learning resource (Chandra, 2021; Ratnawati, 2021). Modules are an alternative source of learning that can be used to foster student learning independence. This is in line with what was conveyed by Prastowo who stated that modules are teaching materials that are systematically arranged in language that is easily understood by students, according to their age and level of knowledge so that they can learn independently with minimal guidance from educators (Kuswanto, 2019; Prastowo, 2013). The related research about module development during this pandemic was also carried out whose research results show that the module is very effectively used as a learning resource during a pandemi and improves students' affective, cognitive and psychomotor abilities (Maksum & Purwanto, 2022; Mauliana et al., 2022). This research confirms that the use of the module can also increase student independence in learning during the pandemic.

The modules that have been developed can also be accessed easily and anytime. Other research said that the type of module must be selected according to the conditions of technological development and characteristics student (Mazrekaj & De Witte, 2020; Sugiani et al., 2019). The limitations of this study do not involve technology, such as electronic modules. Modules are only sent to students in Portable Document Format through the online learning system of the University of Sarjanawiyata Tamansiswa Yogyakarta. It turns out, from the results of the research, the use of electronic modules is better than using printed modules. Electronic modules are more practical and effective in increasing student motivation and learning outcomes. It can even improve student critical thinking (Andriani & Suparman, 2019; Syahrial et al., 2021). The implication of this research for students is that during this pandemic period students can carry out a quality learning process and learning objectives can be achieved properly with the help of this developed science basic concept module. it also has an impact on the readiness of these prospective teachers in preparing to teach in elementary schools, especially in mastering basic science concepts. so that it also has an impact on the readiness of prospective elementary school teachers in doing science learning in the future.

4. CONCLUSION

The conclusion of the research that has been done is to produce a module product with basic concepts of elementary science with characteristics having aspects of clear instruction, self-contained, stand-alone, adaptive, user-friendly, and interesting graphic aspects. The validation results obtained with a very good category. This proves that the developed module is feasible to be used as a source of independent learning for elementary school teacher candidates. Based on the results of the response questionnaire that has been distributed to ten students, data shows that students say that it is very helpful to learn independently during the pandemic, and the modules developed are quite helpful in implementing the learning process during the pandemic.

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Elementary School Students' Mathematical Process Skills in Gender Perspective

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ABSTRAK

Tingkat literasi siswa Indonesia menurut PISA sangat jauh tertinggal dari negara lain. Hal ini membuat kemampuan siswa Indonesia dalam mengolah sains jauh tertinggal dari negara lain. Tujuan penelitian ini yaitu menganalisis perbedaan keterampilan proses yang dimiliki peserta didik laki-laki dan perempuan di sekolah dasar negeri dan madrasah ibtidaiyah swasta. Penelitian ini menggunakan jenis metode survei kuantitatif. Penelitian ini dilakukan di dua sekolah dasar negeri (SDN) dan dua sekolah ibtidaiyah (MIS) swasta. Poppulasi penelitian ini berjumlah 35 orang per kelas. Instrumen dalam penelitian ini adalah keterampilan proses (PS). Metode yang digunakan dalam mengumpulkan data yaitu survey dan kuesioner. Hasil jawaban angket siswa pada PS dianalisis menggunakan statistik deskriptif dan statistik inferensial. Hasil penelitian yaitu terdapat perbedaan keterampilan proses yang signifikan antara peserta didik laki-laki dan perempuan di madasah ibtidaiyah swasta. Dengan dilakukan penelitian ini, akan berdampak dalam memaparkan tingkat perbedaan keterampilan proses antara peserta didik laki-laki dan perempuan antara sekolah negeri dan swasta.

ABSTRACT

According to PISA, the literacy rate of Indonesian students is very far behind that of other countries. It makes the ability of Indonesian students to process science far behind other countries. This study aims to analyze the differences in the process skills of male and female students in public elementary schools and private madrasah Ibtidaiyah. This study uses a type of quantitative survey method. This research was conducted in two public elementary schools (SDN) and two private Ibtidaiyah schools (MIS). The population of this study amounted to 35 people per class. The instrument in this research is process skills (PS). The methods used in collecting data are surveys and questionnaires. The students' questionnaire answers on PS were analyzed using descriptive and inferential statistics. The results of the study were that there were significant differences in process skills between male and female students in private madrasah ibtidaiyah. This research will have an impact on explaining the level of difference in process skills between male and female students in public and private schools.

1. INTRODUCTION

Education is an effort made to improve the quality and capacity of an individual, and can take place anywhere and anytime (Corsi, 2020; Musanna et al., 2017; Pozo-Armentia et al., 2020). Besides being done to improve one's quality and capacity, education is also carried out to improve one's social skills in a social live (Musanna et al., 2017)(Osberg & Biesta, 2021)(Sarid, 2018). Even so, in reality education improves the quality and capacity of a person in a better direction. This is due to various factors that affect the achievement of educational goals. One way to overcome this problem is to increase student interest in learning. With the increase in student interest in learning, the quality of learning outcomes also increases (Mahendra, 2017; Parrish & Lanvers, 2019; Yu et al., 2020). With the rapid development of the times, education is also required to develop to prepare a better generation.

In this fast-paced era, it takes more than just "education" to improve the quality of a person. The development of special skills is also very much needed, especially in the 21st century (Asrial et al., 2020; Barrot, 2019; Harrop et al., 2018). 21st century skills are one of the general abilities needed in human life in the 21st century, including communication skills, problem solving skills, creativity, critical and structured thinking, the ability to work together, and so on. These skills become one of the learning objectives needed to improve one's quality to face the 21st century (Laksana et al., 2020; Sugito et al., 2017; Wei et al., 2020). One of the skills developments developed in 21st century learning is students' skills to think critically and structured (Carson, 2019; Howard et al., 2018; Siswono, 2017). Critical thinking skills are very important because students are required to know the cause and effect of an event. So that students understand a

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problem not only its solution, but also the causes and influences of the problem. Critical thinking skills are one of the most important 21st century skills where these skills are used to solve problems logically and rationally by involving scientific process abilities (Hamdu et al., 2020; Solé-Llussà et al., 2019; Wahyuni et al., 2017). Science process skills are basic skills to find answers by asking questions and conducting various experiments. By applying science process skills, students can connect everyday problems with the knowledge they get at school, so that learning becomes more meaningful for students. With science process skills, students can find concepts and solve problems that they find themselves. This makes students more responsible for the solutions they find (Concannon et al., 2020; Darmaji, Kurniawan, et al., 2019; Iswatun et al., 2017). Improving students' science process skills can be done by increasing students' literacy levels.

Identifying a problem, and explaining it scientifically with concrete evidence is the meaning of scientific literacy. With good literacy skills, students can find answers to a problem, then convey the solutions to the problems they find both orally and in writing (Perdana et al., 2019; Vaughn et al., 2020). Unfortunately, the literacy level of Indonesian students according to PISA (Program for International Student Assessment) is very far behind other countries, this makes the ability of Indonesian students to process science far behind other countries (Akbar, 2018; Ives et al., 2020; Li et al., 2021). There are various ways to increase student literacy levels, including by giving attention and feedback to students or by forming student literacy groups. This will make students have their own desire to improve literacy, either because it is influenced by the attention of the teacher or environmental influences who are also accustomed to literacy (Carless & Winstone, 2020; Vaughn & Fisher, 2020; Warrican et al., 2019). In the end, literacy is a cognitive ability that is influenced by the affective domain. Which is the attitude, motivation, and interest from within the students themselves that determine the low and high level of student literacy.

The attitude of students in learning is very important. Because, students who have a positive attitude will make students more interested in learning the lesson (Jufrida et al., 2019; Kapici et al., 2020). Students' interest in a lesson can affect the level of success in the learning. However, with various age levels, student interests can vary from one student to another. So that interest guidance is needed as motivation for students in facing a lesson (Abbott, 2017; Bolkan & Griffin, 2018; Z. Luo et al., 2020). In learning science, there are many things that affect students' interest in these subjects, including teachers, environment, background, gender, students' self-motivation (J. P. Cain, 2020; J. M. Luo et al., 2019). The interests and interests of students differ from one another. Therefore the guidance of students' interests is very much needed for the success of the learning process.

Mathematics is one of the subjects that must be learned since elementary school. This proves how important mathematics is in life, but mathematics is also one of the most difficult subjects to understand (Arifin & Herman, 2018; Kenedi et al., 2019; Surya et al., 2017). One of the most difficult materials in mathematics is fractions (Akman & Çakır, 2020; Saleh et al., 2018). Contains comparisons of numbers, and it is difficult to describe the problems in real life, making fractions the most difficult material in mathematics. However, there are always ways to solve problems related to the difficulty of learning fractions. One solution is to understand the concepts and basic understanding of students regarding the material being taught (Alan & Afriansyah, 2017; Andrews et al., 2019; Nasution et al., 2018). Of course, students' interests and interests also greatly affect the success of the learning process for fractions, but the student learning environment also affects the student's learning process, one of which is gender. Men have dominated science if we look at the history of science. There are many male characters who influence science. But at this time, women began to influence the world of science. With the existence of 'gender equality' women began to have an influence in the world of science. Basically, the definition of gender is the role or view that is directed at men or women. This view is shaped by social and cultural structures. However, in an era like today, it is possible that women can also be influential in the world of science. However, the result of classical stereotypes in society causes gender inequality

Research related to science process (PS) and interest has been done before, but among these studies there are still some shortcomings. For example, using only two class samples in one school, there is no explanation regarding the effect of gender on students' PS levels (Darmaji, Astalini, et al., 2019; Elvanisi et al., 2018; Hernawati et al., 2018). Whereas previous research related to interest only connected students' interest in learning with learning motivation (Jabari P. Cain, 2020; J. M. Luo et al., 2019; Sarid, 2018). Other research did not compare the process skills between genders (Mutlu, 2020). Meanwhile, other research evaluates the process skills possessed by students. What distinguishes this research from previous research on process skills is that in this research, process skills focuses on analyzing the differences in process skills possessed by male and female students (Yiğit Özüdoğru & Demiralp, 2021). This is very important to do, in order to obtain information related to the advantages and disadvantages of both male and female students. This study also aims to analyze the differences in the process skills of students in public elementary schools and students in private madrasah ibtidaiyah. Thus, the results of this study can be used as an evaluation of

learning in the classroom. Which later, can be used as a basis for creating appropriate learning, in order to achieve learning objectives.

2. METHOD

This study uses a type of quantitative survey method. Qualitative research is a field of inquiry that stands alone, is scientific in nature and aims to understand social reality (Rukin, 2019). The data obtained is the data of process skills (PS). The data has been obtained with a Likers scale 4. This research gains an understanding of a phenomenon from basic logic, usually includes the perspective of the research population. In essence, qualitative research observes people in the environment as well as in the social sciences. The procedure for the quantitative survey method used in the study is presented in Figure 1.

Figure 1. The Procedure for the Quantitative Survey Method (Huber & Froehlich, 2020)

This research was conducted in two public elementary schools (SDN) and two private ibtidaiyah schools (MIS) with the research population consisting of sixth grade students. From this population, two classes were taken in each school with up to 35 students in each class. The instruments in this research are process skills (PS). The assessment instrument is one of the most important assessment instruments for cognitive. The Likers scale used in the student PS research is: 1 (very bad), 2 (not good), 3 (good), 4 (very good), with 47 questions for the student PS questionnaire. This research was carried out as many as 8 samples, namely classes 6A and 6B at SD 1 Pasar Muaro Tembesi, class 6A and 6B at SD 52 Kilangan II, classes 6A and 6B at MIS Nurul Ihsan, classes 6A and 6B at MIS Simpang Sungai Rengas with each each class has 35 students. The sample consists of two groups, namely the experimental group and the control group (Astuti et al., 2018; Fromowitz, 2017). So that the total number of respondents is 70 students. At the time of testing, the male population and female population will be taken. The population is the person who is the subject of research or the characteristics to be studied (Banks et al., 2018). Furthermore, the PS students' questionnaire on the addition and subtraction of fractions can be seen in the Table 1.

Tabel 1. Student PS Instruments Grid on Addition and Subtraction of Fractions

Variable	Indicator	Question Number
Process Skills of Student on the Material Multiplecat of Fraction	Observation	1,2,3
	Communication	4,5,6,7
	Classification	8,9,10,11,12
	Maesuration	13,14,15
	Conclusion	16,17,18,19
	Prediction	20,21,22,23,24
	Table compiling	25,26,27
	Acquire and process data	28,29,30,31
	Experiment analysis	32,33,34,35
	Ctreating hypothesis	36,37,38
	Designing an experiment	39,40,41,42,43
	Do an experiment	44,45,46,47
Total of question		**48**

For student PS research on the material of adding and subtracting fractions, this was carried out using four school samples, namely SD 1 Pasar Muaro Tembesi, SD 52 Kaliangan II, MIS Nurul Ihsan, and MIS Simpang Sungai Rengas, each school consisting of grades VI A and class VIB. The sampling technique used in this study used simple random sampling. The sampling technique was adopted because it provides unbiased parameter estimates and is better if the population is homogeneous (Alhassan & & Chen, 2019; Bankole & Nasir, 2020). Using random sampling can reduce the potential for bias in the selection of cases to be included in the sample. With the condition that random sampling is done because of the homogeneous population, the sampling frame is clear and general in nature.

The results of the student's questionnaire answers on PS were analyzed using descriptive statistics and inferential statistics. Descriptive statistics are often referred to as frequency distributions which provide an accurate measure of data ranging from the smallest to the largest. While inferential statistical analysis aims to estimate parameters and test the hypothesis of a study, so that it can be easier to draw conclusions (Al Mutairi, 2018). Descriptive statistics used in its presentation use estimated values and experimental values, from the two parameters such as mean, arithmetic, and standard deviation. The nomarality test aims to determine whether a data can be said to be normal or not, while the homogeneous test aims to determine whether the data of the two samples is homogeneous or not. The first step in this research is to determine the normality and homogeneity of a data using normality test and homogeneity test. Normality test and homogeneous test if the result data in the population is normally distributed and homogeneous, then the condition is that the sig value is greater than 0.05.

3. RESULT AND DISCUSSION

Result

The data were obtained from four different schools, namely SD 1 Pasar Muaro Tembesi, SD 52 Kaliangan II, MIS Nurul Ihsan, and MIS Simpang Sungai Rengas. This data was then analyzed using descriptive statistics using the SPSS application by school. The results of the descriptive statistical analysis of student PS with observation, measuring, compiling a table, communication indicators. The description of the PS students reviewed through four indicators including indicators of observation, measurement, compiling tables, and communicating. From the results of the research conducted, it was found that on the observation indicators female students had a better average score than male students. While the indicators measure, both male and female students do not have a very significant difference in the level of ability. However, in the indicator of compiling a table male students at SDN 1 Pasar Muaro Tembesi have a better skill level than female students in the same school. Finally, on the indicators of communicating, female and male students do not have a very significant difference in the level of ability, except in MIS Nurul Ihsan where female students have a better skill level than male students with communicating indicators. Furthermore, the normality test for students' PS on learning with the addition and subtraction of fractions can be seen in the Table 2.

Tabel 2. Student PS Normality Test Table.

Variable	Test of Normality		
	Schools	Sig.	Distribute
V_1	SDN 1 Pasar Muaro Tembesi	0.210	Normal
	SDN 52 Kaliangan II	0.403	Normal
	MIS Nurul Ihsan	0.824	Normal
	MIS Simpang Sungai Rengas	0.717	Normal
V_2	SDN 1 Pasar Muaro Tembesi	0.541	Normal
	SDN 52 Kaliangan II	0.671	Normal
	MIS Nurul Ihsan	0.349	Normal
	MIS Simpang Sungai Rengas	0.271	Normal
V_3	SDN 1 Pasar Muaro Tembesi	0.482	Normal
	SDN 52 Kaliangan II	0.231	Normal
	MIS Nurul Ihsan	0.197	Normal
	MIS Simpang Sungai Rengas	0.485	Normal
V_4	SDN 1 Pasar Muaro Tembesi	0.215	Normal
	SDN 52 Kaliangan II	0.561	Normal
	MIS Nurul Ihsan	0.319	Normal
	MIS Simpang Sungai Rengas	0.249	Normal

In the student's PS normality test, it was shown that the four school samples had data that were normally distributed with a sig value greater than 0.05. Furthermore, the homogeneous PS students' test of learning with the addition and subtraction of fractions. Based on data analysis, it can be seen that the results of the data homogeneity test have a sig value that is greater than the sig 0.05. So that the data used in this study is homogeneous. Furthermore, data hypothesis testing in the form of T test is displayed in this study and can be seen in the Table 3.

Tabel 3. Table of Students PS T-Test

School	Gender	N	Mean	Sig.	Sig (2-tailed)
SDN 1 Pasar Muaro	Female	38	124.9211	0.145	0.754
Tembesi	Male	32	124.3125	0.145	0.754
SDN 52 Kaliangan II	Female	38	125.5526	0.398	0.992
	Male	32	125.5313	0.398	0.992
MIS Nurul Ihsan	Female	38	125.8947	0.597	0.043
	Male	32	123.5625	0.597	0.043
MIS Pasar Muaro	Female	38	121.6316	0.313	0.049
Tembesi	Male	32	123.7188	0.313	0.049

From the data above, it can be seen that there is a difference in the level of PS between male and female students in madrasah schools as evidenced by the value of sig (2-tailed) less than 0.05. While in public schools there is no very significant difference between male and female students, as evidenced by the value of sig (2-tailed) greater than 0.05.

Dicussion

Mathematics is a compulsory subject even from elementary school (Nurlaily et al., 2019; Santagata & Yeh, 2014; Utami & Wutsqa, 2017). Generally, mathematics is less attractive to students because the material is difficult (Agustian et al., 2015; Sanusi et al., 2015; Wulandari et al., 2020). One example of the material is fractions. Fractions are one of the most difficult mathematics materials for students, especially elementary school students (Ardina et al., 2019; Hidayati, 2012). In this study, data collection related to students' processing abilities related to the addition and subtraction of counting materials was carried out. The comparison between male and female students in the four schools that became the research sample is very clearly seen in the indicators of communicating. Where, female students at MIS Nurul Ihsan have a much different level of ability compared to male students at the school. However, male students at SDN 1 Pasar Muaro Tembesi have a higher level of ability to compose tables than female students. Meanwhile, in the observation indicators and measuring indicators, there is no significant difference between male and female students. However, in the observation indicators, female students at SDN 52 Kaliangan have the lowest level of ability while other students have a level of ability that is not much different. The same can be seen in measuring indicators. Where male and female students at MIS Simpang Sungai Rengas have a higher level of ability than the others. Thus, gender differences are not the only important factor that affects the level of student PS in each school.

There have been many studies related to PS in mathematics learning, one of which is research (Alan & Afriansyah, 2017). In his research, he conducted an experiment to improve students' PS in solving mathematical problems. The drawback of this research is that Alan only uses two class samples at the same school. So the results and conclusions obtained are not universal. While other studies only use two class samples in one school (Astalini et al., 2019; Elvanisi et al., 2018). There are other studies that test the effect of the model on students' PS levels without explaining variables or indicators that can affect students' PS levels (Alan & Afriansyah, 2017; Iswatun et al., 2017; Wahyuni et al., 2017). Other research did not compare the process skills between genders (Mutlu, 2020). Meanwhile, other research evaluates the process skills possessed by students (Yiğit Özüdoğru & Demiralp, 2021). However, in this study, a comparison of students' PS levels regarding the material of addition and subtraction of fractions was carried out by comparing male students and female students in each school, with indicators of observing, measuring, compiling tables, communicating. So that it can be seen how the level of PS compares for each gender.

In the study, it was found that madrasah students used samples of SD 1 Pasar Muaro Tembesi, SD 52 Kaliangan II, MIS Nurul Ihsan, and MIS Simpang Sungai Rengas. Students at MIS Simpang Sungai Rengas had a higher PS level than the sample of students in other schools. This makes the PS level of madrasah students higher than that of state school students at the elementary school level in terms of adding and subtracting fractions. However, students at SDN 1 Pasar Muaro Tembesi also do not have a PS score that is too low in dealing with the addition and subtraction of fractions which is one of the weaknesses of this study. The weakness of this study is that the study only uses one variable to compare the level of PS between public elementary school students (SDN) and private madrasah ibtidaiyah (MIS) students. Meanwhile, we cannot only compare with only one variable, because there are many things that affect students' PS level. Such as, interests, motivation, self-confidence, environment and so on, which can be used as material for further research.

4. CONCLUSION

There are differences in the process skills of male and female students in grade 6 Public Elementary School and Private Madrasah Ibtidaiyah. It is evidenced in this study, which can be seen that there is no significant difference in process skills between male and female students in grade 6 SD. Meanwhile, in private madrasah ibtidaiyah, there are significant differences in science process skills between male and female students. Factors that cause such interests, attitudes, learning models and so on are the limitations of this study.

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The Impact of The Dissemination of The Covid-19 Epidemic on Social Development in Early Children

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ABSTRAK

Dengan merebaknya wabah Covid-19 seperti mewabah di dunia, kebijakan menjaga jarak fisik (physical distance) dan jarak sosial (social distance) telah mengubah pola kehidupan di segala bidang. Dunia pendidikan di semua jenjang, termasuk pendidikan anak usia dini (PAUD), juga merasakan dampaknya. Belajar di rumah dengan sistem online merupakan pilihan yang sangat diperlukan, yang menimbulkan permasalahan baru di bidang pendidikan. Penelitian ini bertujuan untuk menganalisis dampak wabah Covid-19 terhadap perkembangan sosial anak usia dini. Penelitian ini menggunakan jenis penelitian deskriptif kualitatif. Teknik pengumpulan data menggunakan wawancara, observasi, dan dokumentasi. Teknik yang digunakan untuk memastikan keabsahan data menggunakan segitiga sumber dan waktu, sedangkan teknik analisis yang digunakan dalam penelitian ini adalah teknik analisis kualitatif. Hasil ahkir dari penelitian ini menunjukkan bahwa pengaruh Covid-19 terhadap perkembangan sosial anak usia dini yang mengharuskan pemerintah mengeluarkan kebijakan penerapan pembatasan kegiatan masyarakat (PPKM) yang menyebabkan anak harus belajar dari rumah dan akibatnya berdampak pada perkembangan anak seperti perkembangan kognitif, bahasa dan perkembangan sosial anak usia dini.

ABSTRACT

With the spread of the Covid-19 outbreak, such as an epidemic in the world, the policy of maintaining physical distance (physical distance) and social distance (social distance) has changed the pattern of life in all fields. The world of education at all levels, including early childhood education (PAUD), also feels the impact. Studying at home with an online system is an indispensable option, creating new problems in the field of education. This study aims to analyze the impact of the Covid-19 outbreak on the social development of early childhood. This research uses a qualitative descriptive research type. Data collection techniques using interviews, observation, and documentation. The technique used to ensure the validity of the data uses the source and time triangle, while the analytical technique used in this study is a qualitative analysis technique. The final results of this study indicate that the influence of Covid-19 on the social development of early childhood requires the government to issue a policy of implementing community activity restrictions (PPKM) which causes children to study from home and consequently has an impact on children's development such as cognitive development, language, and development early childhood social.

1. INTRODUCTION

Education is a long-term investment that requires substantial funds and effort. Education serves to improve the quality and quality of society so that they can live better (Koehler & Schneider, 2019; Ratten, 2020). The education process itself is carried out since humans are born. The basic education of a child begins with early childhood education. The implementation of early childhood education aims to provide optimal stimulation for children (Kurniah et al., 2019; Muhdi et al., 2020). Early childhood education is an effort to train children from birth to six years of age by providing educational stimuli to help them grow physically and spiritually so that children are ready to enter further education (Gayatri, 2020; Kuswandi et al., 2020; Redondo et al., 2020). Thus we must reorganize the management of early childhood education so that it can be carried out effectively, efficiently, productively and accountably in order to increase the growth and development of children (Fegert et al., 2020; Kazu & İş, 2018). The teaching and learning process is essentially a reciprocal interaction between students and teachers that occurs in the school environment (Jurkowski & Müller, 2018; Melasalmi & Husu, 2019). This activity is carried out as an effort

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to convey messages from the source of the message to the recipient of the message. Communicators, communicants, messages, and message channels are components that must exist in the process of learning activities. In normal circumstances, learning activities at all levels of education are carried out inside and outside the classroom (Nisa & Kusmiati, 2020; Sumandiyar et al., 2021). Activities are also carried out directly through face to face between teachers and students so that there is reciprocal interaction in the learning process.

However, these activities seem to have to be replaced with new activities that have never been imagined and thought of before. Work From Home (WFH), Learn From Home (LFH), and Learning From Home (BDR) are new terms that are widely applied in this COVID-19 pandemic (Feng & Zhou, 2022; Slovaček & Čosić, 2020). This is done by the government as an effort to reduce the rate of transmission of the epidemic that is spreading in the world. Education is one of the zones most affected by the Covid-19 outbreak (Putra et al., 2020; Rumbley, 2020; Sumandiyar et al., 2021). This is because the Covid-19 outbreak spreads quickly and with a wide scope. Based on a report from ABC News on March 7, 2020, there were school closures in several countries as a result of the COVID-19 pandemic (Kowal et al., 2020; Siddique et al., 2021). The problems currently being faced by educators require that all activities be centered at home starting from work, study, and school through an online learning system, given how vicious and fast the transmission of this virus is, the government instructs all elements of educational institutions to continue carrying out the learning process. through online that is completely online, so educators are required to be able to adapt to the new education system known as the new normal so that collaboration between educator elements and family elements is needed so that the learning process that is carried out continues to run well.

The word interaction in general can be interpreted as an activity that is interconnected or reacts to each other that occurs in two or more individuals. While social is related to society. Basically, humans are social creatures, namely creatures who need other people for the survival they live. Humans try to establish good relationships with other people, be it with people who are older or younger than them, even with friends of their age or peers (Mohajan, 2017; Nichita et al., 2021; Nugraha et al., 2018). However, because of the Covid-19 pandemic in 2020, it forces humans to limit their direct interaction with one another. Social interaction is needed in social life, because social interaction is the key to social life itself. Especially for a child, social interaction is one of the things that children need to be able to build character and social skills in interacting with other people (Bottema-Beutel et al., 2018; El-Dairi & House, 2019). The process of development in early childhood occurs rapidly and is fundamental to later life. Early childhood itself is a child aged between 0-8 years. In this phase, the process of growth and development in various aspects occurs, and among them are aspects of moral and social interaction.

Based on the above phenomenon, the learning process at the early childhood education level must continue, even more attention is given to them than normal conditions (Alan, 2021; Yıldırım, 2021). Children need education to optimize all aspects development for the future in taking the next level (Dong et al., 2020; Gayatri, 2020). Other research said that the learning process from home through online learning ideally they should still be able to meet the learning needs of students in order to develop skills and interests according to their level of education (Astuti, 2021; Suhendro, 2020). To do this, educators need to develop appropriate curricula, available learning resources, as well as support for fixed devices and networks so that communication between students and educators can be effective. Readiness of human resources includes educators (teachers and lecturers), students, and parental support are the most important parts in the implementation of online learning (Erawati et al., 2021; Lafave et al., 2021). The online learning process is expected to remain a solution during this pandemic. With the many obstacles faced in the online learning process, educators must continue to carry out their duties to educate.

Differences in previous studies discuss about student learning outcomes while in the research that will be carried out discusses online learning in TK Gugus Mawar Kec. Coastal Tassel (Norkhalifah, 2020). The similarities between previous research and this research are both discussing the effectiveness of online learning during the pandemic. The difference in the previous research was carried out in PAUD in Kediri City, while this research was carried out in PAUD Kec. Rumbai Pesisir (Egan et al., 2021). The purpose of this study is to present information related to teacher perceptions regarding the challenges of implementing online learning at home due to the impact of the Covid-19 pandemic at PAUD Padang City.

2. METHOD

The research method uses a qualitative research field, namely: research procedures in the form of written and spoken words from people and observable behavior of informants (Phillippi & Lauderdale, 2018). Therefore, the primary data needed is in the form of interviews with informants. In this case, this approach is closely related to observations (Field-Springer, 2020). The nature of the research used is

descriptive qualitative case study type. The case study includes an in-depth and contextual analysis of a similar situation with another organization, where the nature and definition of the problem that occurred was similar to the problem being experienced today. In the context of this research, the research subjects are early childhood children who study at AL-Fadhilah Kindergarten, Dusun Getap, Paok Village, Lombok, Suralaga District. This research activity began with a field survey, while the research location used by researchers was in AL-Fadhillah Kindergarten, Dusun Getap, Tebaban Village, Suralaga District.

The data is the result of the author's recording, both in the form of facts and figures. The source of data in the study is the subject of the data obtained. "The main data sources in qualitative research are words, and the rest of the actions are additional data such as documents and others. Data is results recording Writer, ok in the form of fact nor numbers. Source of data in study is subject from the data obtained. "The main data source in study qualitative are words, and action the rest is additional data like document and others. As for researcher sources used in compiling Report this grouped Becomes two that is primary source and source secondary. Data collection techniques are the most important step in research, because the main purpose of research is to obtain data. Without knowing data collection techniques, researchers will not get data that meets the data standards set, so researchers in this type of qualitative research use data collection techniques through interviews, observation and documentation (De Andrade et al., 2018).

Validity of data in study qualitative aim for knowing the credibility of the data collected During research. Techniques used for test validity of data in study this is data triangulation , data triangulation , namely more techniques prioritize effectiveness results research.In study this researcher use method study qualitative, that is use words, things this can influenced by credibility the informant , time disclosure, the conditions experienced (FitzPatrick, 2019). In addition to using triangulation of data, this research also uses triangulation of time and triangulation of sources. Data analysis is an activity after data from all data sources are collected. technique analysis used in study this is technique qualitative data analysis , namely base analysis on existence connection semantics between problems study Data analysis in study qualitative using the *Miles* and Huberman model. The Miles and Huberman model qualitative data analysis techniques include Data Reduction (Data Reduction), Data Display (Data Presentation), and Conclusion Drawing/Verification (Conclusion).

3. RESULT AND DISCUSSION

Result

Some of the impacts caused by the learning from home (BDR) process include the following. Many parents complain about their children's declining development due to the lack of parental skills in providing guidance when children have to study from home. This is evidenced by the answer of the first respondent by responding: When learning from home, children are lazy so that learning outcomes are less than optimal, plus my inability to provide guidance to children when children have to study from home. Based on this response, the author's analysis states that the basic needs of children that must be met for optimal child development are physical-biomedical needs (nurturing), emotional/love needs (love), and the need for mental stimulation (stimulation). Learning Becomes not enough effective. This is because the learning process is carried out at home by utilizing assistance from parents, this problem is strengthened Based on results answer from a number of respondents. As stated by the first respondent said that Learning through the online system is less effective because during this pandemic there is an appeal to make online learning that does not burden children. So basic competencies do not have to be achieved, the most important thing is only to provide contextual learning theory that does not burden children and parents.

This phenomenon is very unfortunate considering the opinion says that children learn actively through experiences that are done directly (Louis et al., 2019). This sociocultural theory also states that parents, caregivers, and peers also play an important role. Children think differently than adults. In addition, one's thought process is also considered as an important aspect that determines the way one understands the world (Vygotsky, 2019). Impact activity learning done from House consequence from covid-19 pandemic against development social child of them is as following. First, Children become less social. That thing conducted because protocol applied health government to use reduce rate the transmission of covid-19 with implement social distancing. So expected everyone, no except children for permanent be at home and avoid crowd. Activity the of course good for applied to use guard health so as not infected the covid-19 outbreak, however of course will give impact for development social child.

This is reinforced by the opinion which states that at this time the level of social interaction skills will be seen, his ability to get along, and the ability to adapt to circumstances or rules that exist in the surrounding environment (Eadie et al., 2021; Lafave et al., 2021; Timmons et al., 2021). Besides that, this process can also made exercise and guidance for child for going to on level more social personality good

again and naturally will print responsible generation answer. Second, Children's motivation to decrease. This information was obtained from a statement given by Mrs. Rina Oktia Yulianti as the student's guardian from M. The word of maulana marzuki who said that: Now the face-to-face learning process is no longer valid and the current trend is the online learning process that utilizes the WhatsApp application, while learning activities like that make children not happy. friends while now the children only study from home. This statement is in line with the opinion which states that the pattern of social behavior in early childhood is competition, competition is an encouragement for children to carry out activities to produce the best possible results (Spiteri, 2021; Timmons et al., 2021).

COVID-19 pandemic has also provided impact on development language child , like demonstrate expressive language skills (express language verbally and non-verbally), and understand receptive language (listening and reading). This was obtained through the expression given by Mrs. Susilawati as the homeroom teacher for group A2 which said that: The learning process through the online system can have an impact on children's language development because when the online learning process is carried out there are no activities that are usually carried out during normal activities such as expressing wishes, answering simple questions and and retelling what has been done or heard. This expression is in line with the opinion which says that the development of speak and speak the could develop along running time (Davies et al., 2021; Dias et al., 2020; Wheeler & Hill, 2021). Environment including environment school is wrong one agent who has influence on development speak and speak child. Through school , child will study Imitate and repeat the words used by the teacher and inhabitant school other (Tohidast et al., 2020).

Discussion

Based on the results of data processing and interviews, it was found that parenting styles affect children's emotional abilities during this pandemic. With the Covid-19 Pandemic and with the issuance of a Joint Decree of 4 Ministers which provides a policy that the teaching and learning process is moved to home in order to suppress the spread of the Corona Virus, parents and teachers are overwhelmed. The home study policy set by the Ministry of Education and Culture was initially very unexpected and should not have happened, but due to the current situation and conditions that do not allow the learning process in school institutions, the reason is to prevent the Corona Virus outbreak from spreading too far and causing an impact. especially in the field of education. The Ministry of Education and Culture is trying as much as possible so that education actors, such as teachers to students, must still be able to get proper and optimal learning.

At the age of 4-5 years, the child not only describes himself psychologically, but sees other people (Davies et al., 2021; Dias et al., 2020). By seeing and paying attention to other people, children add insight and knowledge in the social field. Most of this information is obtained by children from their playing activities (Cusinato et al., 2020; Di Giorgio et al., 2021). Playing is a fun activity for children, because basically the world of children is the world of play (Fauziddin & Mufarizuddin, 2018; Leggett, 2017). When playing, children are free to express their feelings, such as angry, sad, happy, happy, and satisfied. Especially when children play with their friends in groups, children can get more information from all kinds of emotions shown by their friends than playing alone. Therefore, social interaction in early childhood is very necessary because children will be taught how to live in society, then the child will also be taught various roles which will later become self-identification, besides that when doing social interaction the child will get various information that is around him. However, restrictions on social interaction during (Hugelius et al., 2021; Mertala, 2019).

In line with the research, PAUD teachers are required to be creative and innovative in online learning, learning activities can use tools and materials that are easily found around the child's home (Ferri et al., 2020; Satrianingrum et al., 2021; Silk et al., 2020). However, from the three questionnaire statements, the researchers found that in online learning there are still teachers who give assignments to children not on time. This pandemic makes the social scope of a child limited, they cannot leave the house and play freely with their peers (Alan, 2021; Dong et al., 2020; Gayatri, 2020). Restrictions on social interaction in children can affect social and language development in children. Social development is an achievement of maturity in social relations, it can also be interpreted as a learning process to align oneself with norms, morals, and traditions, namely assembling themselves into a unity that communicates and cooperates with each other. This can have an impact on the psychological state of a child and can make him unfamiliar with his social environment later and make him reluctant to interact with others.

4. CONCLUSION

The learning process through the online system can affect the cognitive development of early childhood because of the lack of ability of the guardians of students to provide guidance and assistance

when the online learning process is carried out so that it has an impact on children's learning. Government regulations requiring every element of education to carry out online learning activities also impact early childhood social development. Educational institutions or schools must continue to pay attention to and unite early childhood development, especially during this pandemic. It is hoped that education, in particular, will increase their creativity in providing learning so that children do not get bored quickly even though they are doing learning activities.

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Online Project-based Learning Integrated Quizizz as a Formative Assessment to Trigger High Order Thinking Skills

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ABSTRAK

Pandemi Covid-19 menimbulkan berbagai dampak dalam proses pembelajaran, salah satunya adalah learning loss. Learning loss secara langsung dan tidak langsung akan mempengaruhi keterampilan berpikir tingkat tinggi. Penelitian ini bertujuan untuk menganalisis perbedaan HOTS antara siswa yang mengikuti Online Project-based Learning terintegrasi quizizz sebagai asesmen formatif dengan HOTS siswa yang mengikuti pembelajaran online biasa. Penelitian ini melibakan populasi sebanyak 129 orang dan sampel sebanyak 39 orang yang ditentukan dengan teknik random sampling. Jenis penelitian ini termasuk penelitian ekspimen semu, dengan desain non equivalen control group design. Instrumen yang digunakan untuk menjaring data adalah tes HOTS dalam bentuk uraian. Data yang diperoleh dianalisis dengan menggunakan ANAVA satu jalur, yang sebelumnya dilakukan uji prasyarat. Semua analisis data menggunakan bantuan SPSS IBM for Windows 16.0. Hasil analisis data menunjukkan bahwa terdapat perbedaan HOTS antara siswa yang mengikuti Online Project-based Learning terintegrasi quizizz sebagai asesmen formatif dengan HOTS siswa yang mengikuti pembelajaran online biasa. Untuk itu, para guru diharapkan menerapkan Online Project-based Learning terintegrasi quizizz sebagai asesmen formatif dalam pembelajaran untuk memperoleh kemampuan berpikir tingkat tinggi yang lebih maksimal.

ABSTRACT

The Covid-19 pandemic has caused various impacts in the learning process, one of which is learning loss. Learning loss will directly and indirectly affect higher order thinking skills. This study aims to analyze the difference in HOTS between students who take Online Project-based Learning integrated quizizz as a formative assessment and HOTS students who take regular online learning. This study involved a population of 129 people and a sample of 39 people who were determined by random sampling technique. This type of research is a quasi-experimental research, with a non-equivalent control group design. The instrument used to collect data is the HOTS test in the form of a description. The data obtained were analyzed using one-way ANOVA, which had previously been tested for prerequisites. All data analysis using the help of IBM's SPSS for Windows 16.0. The results of data analysis show that there are differences in HOTS between students who take Online Project-based Learning integrated quizizz as a formative assessment and HOTS of students who take regular online learning. For this reason, teachers are expected to apply Quizizz's integrated Online Project-based Learning as a formative assessment in learning to obtain maximum higher-order thinking skills.

1. INTRODUCTION

The outbreak of the Covid-19 case found in Wuhan, Hubei, China in 2019 changed all the order of life in the world (Balaji et al., 2020; Febryani et al., 2020; Hui et al., 2020; Şeker, 2022). Covid-19 has spread to Indonesia and peaked in March 2020 (Regus, 2022; Sinamo & Hanggraeni, 2021). The government has issued a work from home (WFH) policy so that this virus does not spread massively (Khasanah et al., 2020). The response from the world of education is to change the traditional education system to education technologies (EdTechs), where teaching and assessment is carried out online (Amit et al., 2020). Schools and campuses are all "closed" or switching to study on campus to home as a consequence of WFH's policy. With WFH, social and physical distancing can be implemented to reduce the spread of the virus. From kindergarten to university, online learning is carried out, starting from the 2020/2021 new school year. In elementary school education units (SD), teachers in online learning use several platforms or learning management systems (LMS) such as Zoom, Google Meet, Google Classroom, Moodle, etc. However, from the results of observations in the field, teachers tend to use WhatsApp (WA) social media in carrying out online learning. By forming a WA group with homeroom teacher and students, teachers use this group as a means of online learning. Beginning with uploading a learning video, students are asked to watch and continue

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working on assignments, then parents send proof of completing the assignment via private message to the homeroom teacher (Mahendra, 2021). This online learning model is certainly less effective and has fatal consequences for students' high order thinking skills (HOTS). Students only watch videos and do assignments, students are less active, cannot be creative in the learning process. There are many complaints from parents, because the more active and as a teachers are the parents, while the teacher's job is only to upload assignments. This is in line with the findings of the Ministry of Education and Culture that the signs of "learning lost" have already begun to occur. This is based on the results of a diagnostic assessment carried out by teachers during the Covid-19 pandemic.

Learning lost is the loss of students' abilities and learning experiences. Most of the teachers assessed that half of the students did not meet the competency standards based on the diagnostic assessment carried out. In percentage terms, 47 percent of schools/teachers said that only 50 percent of students met the competency standards. In addition, as many as 20 percent of schools/teachers assessed that a small percentage of students met the competency standards. This means that students who meet competency standards are only under 50 percent. Meanwhile, as many as 31.9 percent of schools/teachers assessed that most of their students had met the competency standards. If most teachers assess their students do not meet the competency standards, it means that there is a tendency for learning lost to occur. This leaning loss will also have an impact on the declining HOTS of students.

If this is allowed, of course it will not be good for learning development, especially HOTS students. An online learning approach is needed that is able to increase the active role of students, so that it leads to increasing student' HOTS. An online learning model that can improve students' higher-order thinking skills is online project based learning (OPjBL). Learning will be more effective by doing projects and students being actively involved in tasks that are inseparable from inquiry in real-world contexts (Bailey et al., 2013; Bryce et al., 2001). Assignments in the form of real projects play an important role in learning, because they can motivate and improve cognition (Blumenfeld et al., 1991). Several studies have shown the advantages of PjBL over conventional learning. Students who take PjBL have higher learning outcomes than students who take conventional learning (Marx et al., 2004; Rivet, A., & Krajcik, 2004).

The implementation of OPjBL is alleged to provide maximum results when combined with an appropriate online formative assessment. However, in addition to the problem of online learning, many questions have arisen about the quality of the assessment carried out by teachers, due to the lack of teacher information about assessment patterns and online assessment platforms (Amit et al., 2020). Whereas a well-designed and appropriate assessment can produce benefits for students' employability and the development of other important skills (Thompson & McGregor, 2009). This online assessment is used to improve students' higher order thinking skills, especially in understanding the material presented. One of the online assessment platforms that teachers can use is Quizizz. With this platform students engage in interactive lessons and quizzes. Several studies show that the use of Quizizz can increase learning motivation (Fauziyyah, 2019; Rosiyanti et al., 2020; Solikah, 2020), learning activity (Pitoyo & Asib, 2020), and student learning results (Cristiyanda & Sylvia, 2021; Kurniawan & Huda, 2020). There has been no research on the combination of the application of project-based learning and online formative assessment in its effect on students' HOTS. Therefore, this study aims to determine the advantages of using project-based learning integrated formative assessment online in improving students' HOTS.

2. METHOD

This study uses a quasi-experimental type of research which has a control group, but cannot fully control the external variables affecting the implementation of the experiment (Sugiyono, 2016). This study aims to determine the difference in higher order thinking skills (HOTS) between students who take part in online project based learning (OPjBL) integrated with quizizz as a formative assessment with higher order thinking skills (HOTS) of students who take regular online learning in sixth grade elementary school students. The population in this study were all 6th grade elementary school students in cluster III Marga District, Tabanan Bali as many as 129 people and involving a sample of 39 people using simple random sampling technique, but randomized classes.

The learning approach is divided into two, namely OPjBL integrated Quizizz as a formative assessment and the usual online learning approach is an independent variable. While the dependent variable is students' HOTS. To collect HOTS data, students use a test in the form of an essay. The HOTS test consists of 5 essay questions which have previously been tested for validity using the Pearson formula (Ghozali, 2018; Nurkancana, 1986; Sugiyono, 2016). While the reliability test used the Cronbach Alpha formula (Hair et al., 2017; Puspitasari et al., 2015). The collected data were analyzed using 1-way ANOVA parametric statistics, which previously were prerequisite tests in the form of normality test of data distribution, homogeneity of variance test. All data analysis uses SPSS IBM for Windows version 16.0.

3. RESULT AND DISCUSSION

Result

The object of this research is the difference in students' HOTS as a result of treatment between Quizizz-integrated OPjBL as a formative assessment and regular online learning. The learning of the experimental group and the control group was carried out online, the only difference being the learning model and formative assessment used. So that the research design used is a non-equivalent control group design with 1-way ANOVA as a data analysis tool (Field, 2013). The data in this study are grouped into, namely: 1) the higher-order thinking skills of students who follow the Quizizz integrated OPjBL learning model as a formative assessment (Y1), and 2) the higher-order thinking skills of students who take regular online learning (Y2). The results of the analysis of the size of the data concentration (mean, mode, median) and the size of the data spread (variance and standard deviation) of the students' higher order thinking ability can be seen in Table 1.

Table 1. Recapitulation of the Analysis Results of Students' HOTS Scores

Statistics	$Y_{control}$	$Y_{experiment}$
Mean	68.0556	81.1905
Median	72.0000	82.0000
Mode	53.00	86.00
Std. Deviation	11.52732	8.46534
Variance	132.879	71.662
Range	40.00	36.00
Minimum	46.00	62.00
Maximum	86.00	98.00
Sum	1225.00	1705.00

The normality test in this study used the Kolmogorov-Smirnov data on both groups of students' higher-order thinking skills (Field, 2013). Kolmogorov-Smirnov test analysis showed that sig. > 0.05 of 0.99 and 0.87 respectively for the two groups of data, namely data on higher order thinking skills in the experimental group and the control group. This means that H0 is accepted (failed to be rejected), both sample groups are normally distributed. The homogeneity of variance test in this study was carried out using the Hartley test (Field, 2013). From the results of the analysis of the homogeneity test of the data variance of the students' higher order thinking skills, they came from a homogeneous population with sig values. 0.320 on the statistic based on the mean which is more than 0.05. Based on the results of the prerequisite tests, namely the normality test of the data distribution and the homogeneity of variance test, it can be concluded that the students' higher order thinking ability data comes from a population that is normally distributed and has the same or homogeneous variance. Therefore, hypothesis testing with 1-way ANOVA can be done. The hypothesis test in this study used the variance test (1-way ANOVA), while the results of the 1-way ANOVA analysis can be seen in Table 2.

Table 2. Recapitulation of hypothesis test results using 1-way ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1461.056	1	1461.056	11.972	.001
Within Groups	4515.611	37	122.044		
Total	**5976.667**	**38**			

The results of the analysis show that the F-count value is 11.972 with a sig value. of 0.001. It turns out that the value of sig. <0.05 this means that H0 is rejected and Ha is accepted, so it can be said that there is a difference in high-level thinking skills between students who take OPjBL integrated quizzz as a formative assessment and students who take regular online learning. In other words, there is an effect of implementing Quizizz's integrated OPjBL as a formative assessment of the HOTS of grade VI students in cluster III Marga, Tabanan, Bali. The results of data analysis also showed that the group that took the Quizizz integrated OPjBL as a formative assessment had an average high-order thinking ability score of 75.7083; while the group taking regular online learning had an average higher order thinking skills score of 64.00.

https://doi.org/10.23887/ijee.v6i2.45336Discussion

The results of data analysis using 1-way ANOVA showed that the difference in HOTS between students who took OPjBL integrated quizzz as a formative assessment and students who took conventional

online learning. This shows that so that students' higher order thinking skills can be relied on, it is necessary to improve the quality of learning in this case the learning used. The advantages of OPjBL compared to conventional online learning can be seen from the average HOTS of students. Higher order thinking skills are thinking skills that train students' cognitive abilities at a higher level, that is students are able to combine facts and ideas in the process of analyzing, evaluating to the stage of making in the form of providing an assessment of a fact being studied or being able to create from something that has been studied creatively.

Higher order thinking skills (HOTS) is a thinking process that requires students to manipulate information and ideas in certain ways that give them new meanings and implications. This is in accordance with the characteristics of OPjBL which provides a challenging learning atmosphere, provides motivation, and responsibility and encourages students to work independently (Sugihartono et al., 2020). So with OPjBL students are more creative and challenged in learning. Through the learning syntax, OPjBL activities have stimulated students to optimize students' higher-order thinking skills (Fitri et al., 2018). Furthermore, it is said that the OPjBL syntax which consists of raising an initial problem, designing project activity plans, scheduling project activities, monitoring the implementation of project activities, evaluating project activity results, and evaluating project activity experiences requires students to always think critically and creatively. Where critical and creative thinking skills are part of higher order thinking.

At the elementary level in general, training for low-level thinking skills consisting of C1-C3 namely knowledge, understanding and application has been going well. However, for further thinking skills, namely C4-C6 which consists of analyzing, evaluating and creating or often called higher-order thinking skills, students have not been trained intensively. In fact, students are not used to higher-order thinking, and are less skilled in developing their own knowledge concepts. For that we need a learning approach that is able to train students' HOTS intensively. One such learning approach is project-based learning (PjBL). This approach adheres to a constructivist understanding, which provides flexibility for students to construct their knowledge through the learning experiences gained. Learning with OPjBL requires students to be active in solving problems by initiating an idea that can be generalized into a product as a result of project activities. In this case, students can practice their higher order thinking skills (Fitri et al., 2018). The results of this study are in line with research which showed that project-based learning can train students in improving 4C skills (Creativity, Critical Thinking, Collaborative, Communication) (Purbosari, 2016; Setyowati & Mawardi, 2018). Besides that, what is also important is the ability to think at a higher level. The advantages of OPjBL with ordinary online learning cannot be separated from the formative online assessment used. With quizizz as a form of continuous practice, each meeting provides conducive and fun learning conditions for students (Bury, 2017). In addition, the form of practice questions in the quizizz platform is interactive and interesting for elementary school students (Bicen & Kocakoyun, 2018). So it is not surprising that the combination of OPjBL with Quizizz formative assessment is the perfect combination in improving students' higher order thinking skills.

4. CONCLUSION

With regard to the research results obtained several suggestions that can be put forward are as follows. 1) online learning project based learning (OPjBL) by integrating formative assessment needs to be applied in learning mathematics in elementary schools (thematics), and reducing the application of online conventional learning in order to obtain better higher order thinking skills, and 2) Further research related to Quizizz-integrated project-based online learning (OPjBL) as a formative assessment involving variables and other materials and involving a larger sample.

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Interactive Digital Comic Teaching Materials to Increase Student Engagement and Learning Outcomes

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ABSTRAK

Era digital dan internet of thing telah berdampak pada pola interaksi dalam kegiatan pembelajaran. Pembelajaran secara online dan bahan ajar yang dikemas dalam bentuk digital sudah menjadi kebutuhan. Guru pada level sekolah dasar secara umum belum siap dengan tuntutan perubahan tersebut, terutama dalam mengembangkan bahan ajar digital. Penelitian ini bertujuan meningkatkan keterlibatan siswa dalam proses pembelajaran mandiri secara online dan hasil belajarnya dengan menggunakan bahan ajar komik digital interaktif. Metode penelitian yang digunakan adalah metode penelitian pengembangan model ADDIE (Analyze, Design, Develop, Implement, dan Evaluate). Penelitian ini melibatkan partisipan sebanyak 1373 siswa, 8 Kepala Sekolah, dan 20 guru dari 9 sekolah dasar yang terpilih sebagai tempat uji coba di Kecamatan Tapos Kota Depok, Jawa Barat. Pengumpulan data dilakukan menggunakan instrumen berupa tes hasil belajar dan angket untuk siswa, guru, dan orang tua yang dikirim melalui link google form. Teknik analisis data menggunakan analisis statistika deskriptif dan statistika inferensial yaitu ANOVA satu jalur. Penelitian ini menyimpulkan bahwa penggunaan bahan ajar yang dikemas dalam bentuk komik digital interaktif tema "Organ Gerak Hewan dan Manusia" subtema "Manusia dan lingkungan" teruji efektif dapat meningkatkan intensitas keterlibatan siswa dalam pembelajaran mandiri secara daring dan capaian hasil belajarnya. Implikasi hasil penelitian ini adalah bahwa bahan ajar komik digital interaktif direkomendasikan untuk digunakan dalam pembelajaran mandiri secara daring untuk siswa sekolah dasar.

ABSTRACT

The digital era and the internet of things have had an impact on interaction patterns in learning activities. Online learning and teaching materials packaged in digital form have become a necessity. Teachers at the elementary school level are generally not ready for the demands of these changes, especially in developing digital teaching materials. This study aims to increase student involvement in the online independent learning process and learning outcomes by using interactive digital comics teaching materials. The research method used is the ADDIE model development research method (Analyze, Design, Develop, Implement, and Evaluate). This study involved 1373 students, 8 principals, and 20 teachers from 9 elementary schools who were selected as the pilot site in Tapos District, Depok City, West Java. Data was collected using instruments in the form of learning outcomes tests and questionnaires for students, teachers, and parents sent via a google form link. The data analysis technique used descriptive statistical analysis and inferential statistics, namely one-way ANOVA. This study concludes that the use of teaching materials packaged in the form of interactive digital comics with the theme "Movement Organs of Animals and Humans" sub-theme "Humans and the environment" has been proven to be effective in increasing the intensity of student involvement in online independent learning and the achievement of learning outcomes. The implication of the results of this study is that interactive digital comics are recommended for use in online independent learning for elementary school students.

1. INTRODUCTION

The rapid development of information and communication technology (ICT) has an impact on changes in all aspects of life, including the field of education (Bohak Adam & Metljak, 2022; Hu et al., 2021; Starkey, 2020). ICT gives students and teachers more opportunities to adapt their learning activities as needed, school culture must adapt appropriately to these technological advances (Albini et al., 2016; Hu et al., 2021). Digital technology has strategic potential and opportunities to play a role and support the success of education and learning (Hills & Thomas, 2020; Nindya, M & Dafit, 2022). Digital technology can also be a solution to provide a new learning experience outside the classroom and express a more meaningful form of understanding (Bolliger & Shepherd, 2017; Hills & Thomas, 2020).

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The development of ICT with its digital technology which is very dynamic at this time, should be used by teachers to transform the learning process to be more innovative and creative, so that learning becomes more interesting and varied (Baloran, 2020; Karademir et al., 2021). The use of reference teaching materials towards digital technology can encourage students to learn actively, constructively, investigatively, and exploratory (Jahnke et al., 2022; Lieberman et al., 2009; Mercer et al., 2019; Nkomo, L. M., Daniel, B. K., & Butson, 2021). Further advances have resulted in digital technologies that have the potential to change the work of an educator. But in fact, there are still relatively many elementary school teachers who have not utilized digital technology optimally to improve the quality of their teaching and learning activities (Rivalina, 2015; Starkey, 2020; Starkey & Eppel, 2019). Innovative teaching materials can improve the quality of learning and create a more meaningful learning process for students (Barbara, N. K. R. & Bayu, G. W. 2022). The use of digital technology can motivate and inspire students to learn actively and achieve the expected competencies, regardless of background, language, or disability so it is imperative for teachers to harness the power of technology to support lifelong and sustainable learning (Peters & Araya, 2011). Meanwhile, the facts from the preliminary study show that in general elementary school teachers still use textbooks or conventional learning media, while the demands of the current digital technology era require teachers to make more use of ICT and digital teaching materials. This means that there is a gap between expectations and the reality on the ground. This is caused by the low digital literacy of teachers. This condition is suspected to be one of the causes of the low involvement of students in the learning process which has an impact on the low competence of their learning outcomes. This is also the main reason why it is necessary to develop teaching materials packaged in the form of interactive digital comics.

ICT can be used as a source and medium of learning in elementary schools (Ghavifekr & Rosdy, 2015; Nindya, M. & Dafit, F., 2022). The completeness of facilities for internet access in the school environment where teachers work greatly impacts the quality of their work (Ghavifekr et al., 2006; Madden, Ford, Miller, & Levy, 2005). Based on the results of interviews with a number of elementary school teachers in the Tapos sub-district, Depok City, it was obtained that in general Sekolah Dasar (SD) were equipped with computer facilities and internet networks, although they were limited. In addition to the internet network provided by the school, all teachers also have sufficient internet quota so that it is possible to apply learning using ICT. The main obstacle felt is that generally they, especially senior teachers, find it difficult to understand how to use digital technology and utilize the internet for online and face-to-face learning activities in class. One of the reasons is that teachers lack knowledge/experience and familiarity with ICT (Nomsa Mndzebele, 2013; Salehi & Salehi, 2012). Teachers have difficulty using ICT to support the implementation of their duties because of the rapid development of technology while their competence related to the use of ICT is relatively low. This shows that learning using teaching materials in the form of comics can stimulate students' learning motivation and can improve students' positive character from an early age so that they can succeed in further education.

Comics are a form of presenting teaching materials through illustrated stories that combine images, written text, and dialogue. Comics present a strong visual message in conveying meaning deeply and directly, which conventional texts cannot (Park et al., 2011). The use of comics as teaching aids will stimulate students and make them focus on the topic in achieving the planned targets (Tuncel & Ayva, 2010), feel happy, relaxed and not tense in participating in learning, and affect the achievement of learning outcomes (Buchori & Setyawati, 2015), and the best way to encourage children to think creatively (Koutníková, 2018). Comics can achieve concrete results in learning such as triggering debate and reflection in students (Silva, Santos, & Bispo, 2017). This shows that the educational learning model through comics can stimulate students' learning motivation and can improve student character education from an early age so that they can succeed in further education.

Comic digital teaching materials are teaching materials that are included in the category of interactive teaching materials, this is due to the combination of text, images, and animations (Jazuli, M., Azizah, L. F., & Meita, 2018). Digital comics contain descriptions of teaching materials through dialogues accompanied by pictures. Explanations in the learning process are easier for students to understand if the explanation of the material presented is accompanied by pictures (Manalu Amin, M., Hartono, Y., & Nyimas, 2017; Maufur, S., & Lisnawati, 2017). Teaching materials in the form of digital-based comics are proven to be valid for use in learning and effective in increasing student learning independence (Kusumadewi et al., 2021; Şentürk, 2021), it is easy to access learning materials via smartphones (Handayani, 2016), and help students in directing their learning and promote student learning and assist in the achievement of academic goals and objectives (Kumar, 2017).

A number of studies that develop teaching materials in the form of interactive digital comics are relatively widely carried out. Among them, Development study of digital comics teaching materials for mathematics (Kusumadewi et al., 2021; Mamolo, 2019; Nurfitriyanti et al., 2021). Development study of comics teaching materials in physics (Chercules, L. Hakim, & Lefudin, 2021). Development of comics

teaching materials in biology (Samosa, 2021). Development study of comic teaching materials in the field of the social studies (Şentürk, 2021). Experimental study on the effectiveness of using digital comics media in learning for grade IV elementary schools on the theme of always saving energy (Riwanto & Wulandari, 2018). Development study of interactive e-comic multimedia in the field of language (Siti Ainun Nazhiroh, Muhamad Jazeri, 2021). Various studies as described above, studies on the development of digital comics teaching materials focus more on the topic of teaching materials in certain fields or subjects. It is still rare to develop digital comics, especially for elementary schools that are thematic and interactive. In this development research, the digital comics teaching materials developed refer to the learning themes and sub-themes according to the curriculum and are interactive. The interactive nature allows students to reflect on their learning achievements.

This study aims to develop teaching materials packaged in the form of Interactive Digital Comics Teaching Materials (DCTM Interactive) and test their effectiveness on student involvement in learning and achievement of learning outcomes. This research is urgent and the results will have a significant impact on the transformation of the quality of online learning carried out by teachers. Elementary school teachers and students will be motivated to improve their digital literacy, because the use of Interactive DCTM can facilitate the formation of habits of using digital technology and the internet as learning media. In addition, they can also be motivated to be able to create digital teaching materials that are designed by themselves and upload them on the internet to be accessed by teachers and students. The development and utilization of interactive digital comics teaching materials developed in this study is one example of the efforts that elementary school teachers must make in improving the quality of learning processes and outcomes as well as digital literacy of teachers and students. A study of a number of research results that have been carried out by previous researchers confirms the truth of the thesis (Hockly, N. and Dudeney, 2015; Hockly & Dudeney, 2018).

2. METHOD

The development research method used is a product-oriented development model, namely the ADDIE model (Analyze, Design, Develop, Implement, dan Evaluate) (Walling, 2015). The operational design of activities at each stage of development is presented in Figure 1.

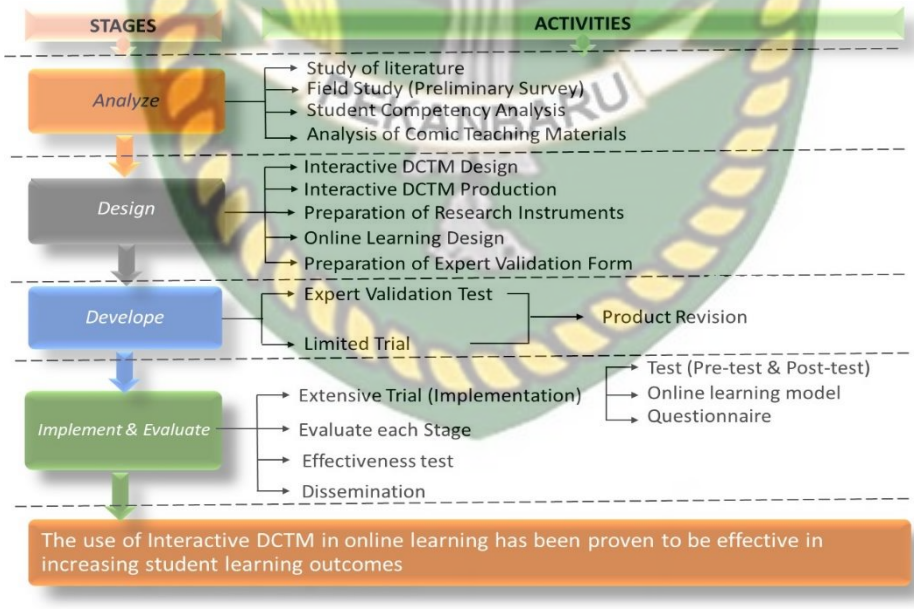

Figure 1. ADDIE Conceptual and Operational Model

This study involved 12 elementary schools that were randomly selected from 117 elementary schools in Tapos District, Depok City, which consisted of 40 State Elementary Schools (SES) and 77 Private Elementary Schools (PES). The research subjects were fifth grade elementary school students. Limited field trials were carried out in 1 class from 1 selected school with 27 students. A wider field trial was carried out in 19 classes, namely 12 classes from SES with 456 students and 7 classes from PES with 141 students so that the total number of students involved in the wide trial was 597 people. The effectiveness test was carried out in 4 classes taken from 2 classes each from 2 elementary schools that were not used in both

limited and wider field trials. The number of students involved in the effectiveness test was 152 people. Thus, the total number of students involved in the research was 776 fifth grade students. The sampling framework is presented in Table 1.

Table 1. Sampling Framework

No.	Sample	School Category	Population	Number of Samples		
				Schools	Clases	Students
1.	Limited field trials	SES	40	1	1	27
2.	Wider field trials	SES	40	6	12	456
		PES	77	3	7	141
	Total		117	9	19	597
3.	Effectiveness test	SES	40	2	4	152

An extensive trial in this study involved 8 principals and 20 teachers from 9 selected primary schools, 1 of whom did not respond when the questionnaire was sent. The demographic data of principals and teachers are presented in Table 2.

Table 2. Principal and Teachers Participant Demographic Data

No.	Demographic Aspects		Principals (N = 8)	Teachers(N = 20)
1.	Gender	M	6	2
		F	2	18
2.	School Origin	SES	5	13
		PES	3	7
3.	Teaching experience	< 5 years	-	4
		5 – 10 years	-	6
		10 – 15 years	2	6
		15 – 20 years	3	2
		> 20 years	3	2

Data collection uses 4 (four) instruments, namely: 1) Learning Outcomes Test, 2) Questionnaire for students, 3) Questionnaire for Principals and Teachers, and 4) Questionnaire for Parents. Grid of learning outcome test instruments is presented in Table 3. The learning outcomes test instrument was tested on 75 students. Test the validity and reliability of the learning outcomes test instrument using the Rasch Model analysis technique using the Winstep application. By using this analysis technique, the results show that the average logit value (logarithm odds unit) of respondents in the learning outcomes test instrument is 0.61 from the dichotomous scale range 0 and 1. The reliability value of the person (respondent) is 0.81 which means it is in the good category, while the item reliability is 0.93 which means it is in the "very good" category. The reliability value of Cronbach's Alpha (KR-20) which shows the interaction between respondents and the instrument items as a whole is 0.83 or can be categorized as "good".

Table 3. Grid of Learning Outcome Test Instruments

Subjects	Competencies	Level						Number of Items
		C_1	C_2	C_3	C_4	C_5	C_6	
Sains	3.1 Explain the organs of motion and their functions in animals and humans as well as how to maintain the health of the organs of human movement.	2	4		4	2		12
	4.1 Make simple models of human and animal movement organs.	1					1	2
Social science	3.1 Identifying the geographical characteristics of Indonesia as an archipelagic/maritime and agrarian country and their impact on economic, social, cultural, communication and transportation life.	1	2	1	2			6
	4.1 Presents the results of the identification of the geographical characteristics of	1	3	2	3		1	10

Subjects	Competencies	Level						Number of Items
		C_1	C_2	C_3	C_4	C_5	C_6	
	Indonesia as an archipelagic/maritime and agrarian country and their impact on economic, social, cultural, communication and transportation life.							
Pancasila and civic education	1.1 Thank God Almighty for the values of Pancasila in everyday life.			1		1		2
	2.1 Be responsible, love the homeland, and be willing to sacrifice according to the values of the precepts of Pancasila.				1	1		2
	3.1 Identify Pancasila values in everyday life.					1		1
	4.1 Presenting the results of the identification of Pancasila values in everyday life.				1			1
Art, Culture, and Craft	3.1 Understanding story images.			1				1
	4.1 Create story pictures.					1		1
Indonesian	3.1 Determine the main idea in spoken and written texts.		1					1
	4.1 Presenting the results of the identification of main ideas in written and oral texts orally, in writing, and visually.				1			1
	Total	**5**	**10**	**5**	**13**	**5**	**2**	**40**

Questionnaires for students were used to collect data about their views on the Interactive BAKBD, seen from the ease of opening, the suitability of language/sentence use, font size, link functionality, fluency of interactive practice questions, and attractiveness of Interactive DCTM. The questionnaire grid for students is presented in Table 4.

Tabel 4. Questionnaire Grid for Students

No.	Aspects	Number of Items
1.	Ease of opening DCTM	1
2.	Ease of understanding sentences and conversations in DCTM	1
3.	Font size used	1
4.	Link functionality in DCTM	1
5.	Smooth use of buttons in working on practice questions	1
6.	The attractiveness of the DCTM serving format	1
	Total Items	**6**

Questionnaires for principals and teachers were used to obtain data on the suitability of the interactive DCTM with the curriculum and the needs of teachers in learning activities. The questionnaire grid for principals and teachers is presented in Table 5.

Tabel 5. Questionnaire Grid for Principals and Teachers

No.	Indicators	Number of Items
1.	DCTM content conformity with curriculum	2
2.	DCTM motivates learning and attracts students' attention	2
3.	The suitability of the DCTM content with the level of development and learning needs of students	2
4.	Supporting teachers optimize student involvement in learning	2
5.	Supporting teachers in improving learning outcomes and digital literacy of students	2
	Total Items	**10**

Questionnaires for parents of students were used to collect data on whether the developed Interactive BAKBD really functions to motivate students' learning as well as to assist parents in guiding their son/daughter's independent study at home. Questionnaire grids for parents of students are presented in Table 6.

Tabel 6. Questionnaire Grid for Parents

No.	Indicators	Number of Items
1.	DCTM helps children's independent learning	2
2.	DCTM motivates and increases children's attention in independent learning at home	2
3.	DCTM is easily accessible for children	2
4.	DCTM Helping parents in guiding their children to study at home	2
5.	DCTM is suitable as a learning resource for children to learn independently	2
	Total Items	**10**

The data analysis technique used descriptive and inferential statistical techniques. Descriptive statistics include the calculation of statistical values which include measures of central tendency, namely the mean, median, and mode, as well as the magnitude of the distribution, namely the standard deviation and variance of all distributions of research data. Inferential statistical techniques were used to test the effectiveness of using interactive digital comics teaching materials in online learning on student learning outcomes. Inferential statistical analysis used is the One-way Analysis of Variance (Anova) technique.

3. RESULT AND DISCUSSION

Result

Description of Product: DCTM Interactive

The interactive DCTM was developed by referring to the results of a theoretical study on the concept of comics, a review of the 2013 Curriculum, and existing teaching materials in the form of printed books and e-books. The chosen theme is theme 1 on "Moving Organs of Animals and Humans" and the selected sub-theme is sub-theme 2 on "Humans and the Environment". According to the explanation in the curriculum, learning for theme 1 subtheme 2 is translated into 6 (six) learning activities, so that the interactive DCTM developed in this study were 6 DCTM with different topics according to the learning subtheme, namely: 1) DCTM 1 with the topic "Benefits of Sport ", 2) DCTM-2 with the topic "Human Movement Tools", 3) DCTM-3 is a teaching material for learning activities 3 with the topic "Map of Indonesia", 4) DCTM-4 with the topic "Natural Appearance", 5) DCTM- 5 is teaching material for learning activities 5 with the topic "Muscles in Humans", and 6) DCTM-6 is teaching material for learning activities 6 with the topic "Maintaining and Caring for Human Muscles". The use of interactive DCTM in learning activities uses thematic and contextual approaches, so that each learning activity involves more than one subject in an integrated manner with the content of teaching materials related to the context of students' daily lives. The six DCTM research products are presented in Figure 2.

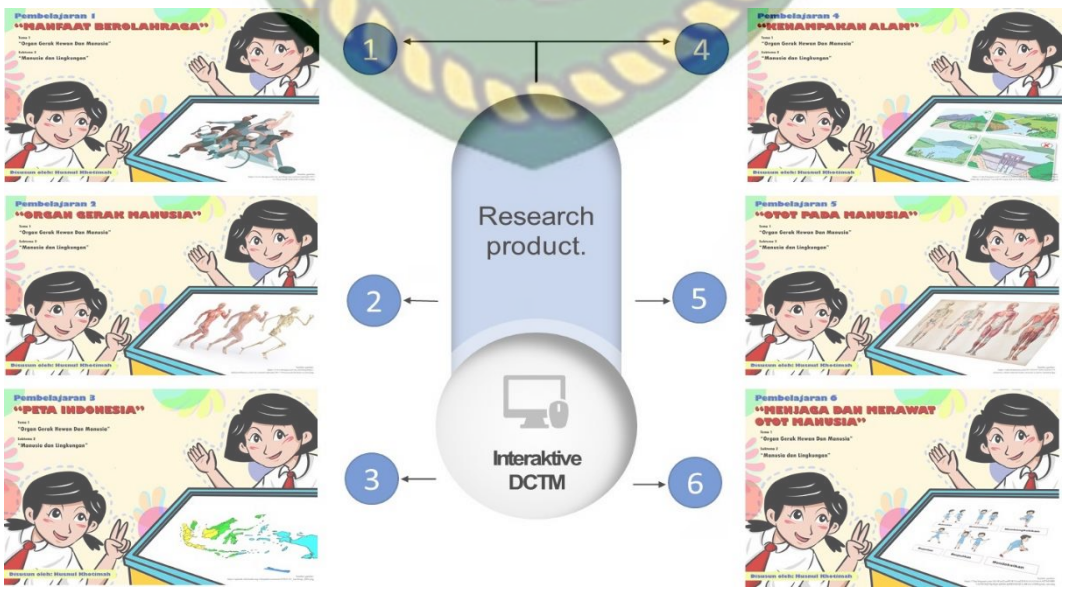

Figure 2. Interactive DCTM as Research Products

Description of Limited Trial Results

This limited field trial aims to test the ease with which students can open DCTM (using a Laptop, Personal Commuter, or Android Phone), readability of DCTM (Language aspect), link functionality with other learning resources, interactive questions at the end of each DCTM section, and student interest in online learning using interactive DCTM.

Table 7. Limited Trial Results Data

No.	Aspects Observed	Frequency of Parent/Student Assessment			Mode
		1	2	3	
1.	Ease of opening DCTM using a Laptop, Personal Commuter, or Android Mobile Phone		2/6	33/21	3/3
2.	Readability and language use			35/27	3/3
3.	Link functionality on DCTM		2/0	33/27	3/3
4.	Functionality of interactive practice questions			35/27	3/3
5.	Interactive DCTM attraction		4/0	31/27	3/3

Notes: 1 = Unfavorable; 2 = Sufficient; 3 = Favorable

After students finished studying online at home using the interactive DCTM, parents and students were asked to fill out a questionnaire containing questions according to the purpose of the limited trial. The number of parents who filled out the questionnaire was 35 people, but only 27 students succeeded in filling out the questionnaire. The results of parent and student assessments of the six interactive DCTMs are presented in Table 7. Based on the table, the mode of the five aspects observed in the limited trial is 3 from a rating scale range of 1-3. Thus, it can be concluded that the six DCTMs can be declared valid so that they can proceed to the next validation stage, namely validation through wider field trials.

Description of Wider Field Trial Results

The wider trial aims to test the interactive DCTM function in increasing student involvement in independent learning activities through online learning modes, both synchronously and asynchronously. The interactive DCTM trial was conducted for 6 days. After students have completed online learning using interactive DCTM, then teachers, principals, and parents of students fill out a questionnaire. The questionnaire for principals and teachers consists of 10 items related to the suitability of the interactive DCTM with the learning needs of students and teachers in teaching. The assessment score uses a scale of 1 to 3. A score of 1 if it is considered not good, a score of 2 if it is considered sufficient, and a score of 3 if it is considered good. Thus, theoretically the minimum score is 10 and the maximum score is 30. Descriptive statistics on the results of principals and teachers' assessments of interactive DCTM after being piloted in their schools are presented in Table 8. Based on the table, it can be seen that empirically the minimum value is 17, the maximum is 30, and the average is 27.21. Thus, the average teacher and principal assessment of the interactive DCTM is close to the theoretical maximum value, so it can be categorized as good.

Table 8. Descriptive Statistics of Principal and Teacher Assessments

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Principal and Teacher Assessments	28	17	30	27.21	.739	3.910
Valid N (listwise)	28					

The questionnaire for parents consists of 10 questions regarding the suitability of the interactive DCTM with students' learning needs for independent study at home. Descriptive statistics on parental assessment of interactive DCTM after their son/daughter learns independently online at home using interactive DCTM are presented in Table 9.

Table 9. Descriptive Statistics of Student Parents Questionnaire Data (N =356)

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Parents Assessments	356	14	30	24.58	.287	5.420
Valid N (listwise)	356					

Based on descriptive statistics of parental assessment data after their son/daughter learns independently online at home using interactive DCTM, it is obtained that the minimum score is 14 and the maximum is 30. The empirical average is 24.58 and the standard deviation is 5.42. When compared with the ideal or theoretical average of 30, the empirical average is close to the ideal average. Thus, based on these data, parents assess the interactive DCTM can be categorized as good. This means that parents consider that interactive DCTM can help them guide and direct their son's/daughter's learning, thereby reducing the difficulties they experience in replacing part of the teacher's role in guiding their daughter's learning. Thus, based on the results of the questionnaire data analysis of students' parents, this development research concludes that interactive DCTM can increase the intensity of the involvement of elementary school students in the online independent learning process.

The learning outcomes achieved by students were measured using a test consisting of 40 questions with a duration of 120 minutes. Descriptive statistics on learning outcomes data are presented in Table 10. From the table it appears that the smallest score is 25.00, the highest score is 100. This means that there are students who get perfect scores. The mean (mean) of learning outcomes achieved by students is 68.68 from a scale or range of values from 0 to 100 with a relatively small standard deviation of 15.90. Meanwhile, the median is 70.00 and the mode is 75.00.

Table 10. Descriptive Statistics of Learning Outcome Data

Statistics	Learning Outcomes
Mean	68.68
Median	70.00
Mode	75.00
Std. Deviation	15.91
Variance	253.00
Minimum	25.00
Maximum	100.00

Based on the middle values, namely mean, median, and mode, it appears that the value of mode > median > mean. This shows that the distribution of learning outcomes data tends to skew or shift to the right. This means that there is a tendency for more values that are above the median and mean than those that are below it. This fact illustrates that the learning outcomes achieved by students in online learning trials using interactive DCTM can be categorized as moderate to high with the deviation of values from the mean not too far. The average learning outcomes achieved by students based on their gender are presented in Table 11. The average achieved by male students is 68.04 with a standard deviation of 15.80. The average achieved by female students is 69.30 with a standard deviation of 16.02, while the total average is 68.68 with a standard deviation of 15.91. The statistical value shows that the average learning outcome of female students is slightly higher than that of female students.

Table 11. Average Learning Outcomes by Gender

	Learning Outcomes		
Gender	Mean	N	Std. Deviation
Male	68.04	191	15.80
Famale	69.30	200	16.02
Total	68.68	391	15.91

To test the significance of the difference between the two mean learning outcomes of male and female students, a different mean test was performed, the results of which are presented in Table 12. From the table, it can be seen that the value of F = 0.616, the significance level of p = 0.433, which means the two means are not significantly different. significant. Thus, there is no difference in the average learning outcomes of male and female students after they complete online independent learning using interactive DCTM.

The average learning outcomes achieved by students based on school origin are presented in Table 13. The average achieved by SES students is 67.01 with a standard deviation of 16.08. The mean achieved by PES students is 76.36 with a standard deviation of 12.60, while the total average is 68.68 with a standard deviation of 15.91. The statistical value shows that the average learning outcomes of students from PES are greater than students from SES.

Table 12. Anova Learning Outcomes by Gender

Source of Variance		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	155.932	1	155.932	.616	.433
Within Groups		98515.743	389	253.254		
Total		98671.675	390			

Table 13. Average Learning Outcomes Based on School Origin

	Learning Outcomes		
Asal Sekolah	Mean	N	Std. Deviation
SES	67.01	321	16.08
PES	76.36	70	12.60
Total	68.68	391	15.91

To test the significance of the difference in the two mean learning outcomes of participants from SES and students from PES, a mean difference test was performed, the results of which are presented in Table 14. The results of the analysis of the two-mean difference test using Fisher's exact test obtained the value of F = 20.86, the significance level p = 0.00 which means the two means are very significantly different. Thus, there is a difference in the average learning outcomes of students from SES with the average learning outcomes of students from PES after they complete independent online learning using interactive DCTM. In this case, the average learning outcomes of students from PES are greater than the average learning outcomes of students from SES.

Table 14. Anova Learning Outcomes Based on School Origin

Source of Variance		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	5021.63	1	5021.63	20.86	.000
Within Groups		93650.04	389	240.75		
Total		98671.68	390			

Description of Effectiveness Test Results

Descriptive statistics on learning outcomes for the experimental class and control class are presented in Table 15. Based on the table, it appears that the average learning outcome for the experimental class is 69.14, higher than the control class, which is 62.66. The significance test of the difference between the average learning outcomes of the experimental class and the control class was carried out using one-way ANOVA. Before the one-way ANOVA test was carried out, the analysis requirements test was first carried out, namely the distribution normality test and the homogeneity of variance of the learning outcomes of the experimental class and control class.

Table 15. Descriptive Statistics of Learning Outcomes

Statistics Descriptive		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
Learning Outcomes	Experiment	67	69.14	11.98	1.46	66.22	72.06	37.50	95.00
	Control	76	62.66	17.22	1.97	58.73	66.60	27.50	97.50
	Total	143	65.70	15.29	1.28	63.17	68.23	27.50	97.50

The normality test of the data distribution used the Kolmogorov-Smirnov normality test technique. The test criteria are if the significance value (sig.) p > 0.05 then the research data is normally distributed, otherwise if the p value is 0.05 then the research data is not normally distributed. The results of the normality test using this technique showed the Kolmogorov-Smirnov statistical value for the experimental class was 0.093 with a significance level of 0.200, while the control class was 0.092 with a significance level of 0.177. The second level of significance is greater than 0.05. Thus, the experimental and control class learning outcomes data are both normally distributed. Test the homogeneity of variance of both

experimental and control distributions using the Levente test technique. The test criteria are if the significance value (sig.) p > 0.05 then the decision is to accept Ho which means the variance of the experimental class and control class is homogeneous, on the contrary if the p value ≤ 0.05 then the decision is to reject Ho which means there is a difference in variance between classes. experiment and control. The results of the homogeneity of variance test showed that Levene's value for learning outcomes was 11.704 with a significance value (sig.) p = 0.01. Thus, H_0 is accepted which means that the variance of the distribution of learning outcomes data between the experimental class and the control class is homogeneous.

The results of the one-way ANOVA test are presented in Table 16. The test criteria are if the significance value (sig.) p > 0.05, the decision is to accept H_0 which means there is no difference in average between the experimental class and the experimental class. On the other hand, if the p ≤ 0.05, the decision is to reject H0 which means that there is a difference in the mean between the experimental class and the control class. It can be seen that the F value is 6.65 with a significance value (sig.) p = 0.011. Thus, H_0 is rejected, which means that there is a significant difference in average learning outcomes between the experimental class and the control class.

Table 16. One-Way Anova of Learning Outcomes and Digital Literacy

Variable		Sum of Squares	df	Mean Square	F	Sig.
Hasil Belajar	Between Groups	1493.97	1	1493.97	6.65	0.011
	Within Groups	31698.60	141	224.81		
	Total	33192.57	142			

Based on the results of the two-average difference test using the one-way ANOVA technique as described in Table 16, it can be concluded that the use of interactive DCTM in online independent learning is effective in improving student learning outcomes. Thus, the interactive DCTM developed in this study meets the criteria and can be recommended for use in learning activities in elementary schools.

Discussion

Based on the results of data analysis of the results of limited and wider field trials, it was found that interactive DCTM significantly improved student learning outcomes. Interactive DCTM is estimated to have a positive effect on student academic achievement because its use in online independent learning activities can increase the intensity of student involvement in the learning process, learning motivation, and thinking ability. Several similar studies in various fields support this result (Affeldt et al., 2018; Chen et al., 2018; Enteria & Casumpang, 2019; Khaira, N., Yusrizal, Y., Gani, A., Syukri, M., Elisa, E., & Evendi, 2020; Şentürk, 2021; Sipayung et al., 2020). The use of interactive DCTM is predicted to have a positive effect on student engagement in learning by positively influencing students' attitudes and motivation towards lessons, increasing their desire to learn, encouraging creative learning, and supporting audio, visual, and audiovisual learning. Several studies in various fields support this result (Ilhan, G. O., and Oruc, 2019; Ulfa, 2018).

This development research found that the use of interactive DCTM in online independent learning for fifth grade elementary school students was effective in significantly improving student learning outcomes. That is, with the presentation of teaching materials packaged in the form of interactive DCTM, the achievement of learning outcomes as the main effect expected from the learning process can be effectively increased. This finding is supported by research results which show that the use of comics is effective for transferring information or communicating concepts, especially abstract concepts, and improve science competence (Caldwell, 2012; Hidayat & Rostikawati, 2018; Tuncel, G., & Ayva, 2010). Digital comics have unique characteristics for critical reflection of texts, as the comic genre encourages multiple meanings, juxtaposing ideas, humor, and counterintuitive lines of direction (Sockman et al., 2016). The two results of this study are strong rational and empirical reasons to explain why the use of interactive DCTM developed in this study is effective in improving student learning outcomes.

The results of the effectiveness test comparing the average learning outcomes of groups of students who learn to use interactive DCTM with groups of students who use conventional textbooks provided by schools show that there is a significant difference. In this case, the use of interactive DCTM is more effective than conventional textbooks on student learning outcomes. Several similar studies show the same findings (Nindya, M & Dafit, 2022; Puspitorini, R., Prodjosantoso, A.K., Subali, B., 2014; Şentürk, 2021). The more positive effect of interactive DCTM on student learning outcomes is predicted to be related to the presentation of interactive DCTM features that are more suitable for elementary school age children. This is based on the reason that interactive DCTM is designed by considering student characteristics, including

learning styles, interests, interest in picture stories, and learning speed, so that interactive DCTMs have more impact than conventional textbooks. The use of interactive DCTM makes it easy for students to control the study time for each sub-theme of the lesson they are studying. Interactive DCTM provides opportunities for students to repeat lessons without being boring compared to conventional textbooks. The interactive practice questions provided at the end of each interactive DCTM allow students to assess their own learning outcomes, and they will be encouraged to repeat that part of the lesson if they feel they have not understood it well. When students learn to use the interactive DCTM, they can return to the section they need. They can also carry out learning activities independently without influencing or being influenced by other students. Therefore, the use of interactive DCTM is more effective in directing and controlling student learning. By using interactive DCTM, teachers can control all students remotely, and students can control their own teaching process.

The results of the analysis of the assessment data of teachers, school principals, parents, and students who were netted using a questionnaire, it was concluded that teachers, principals, parents, and students gave positive assessments of interactive DCTM. They responded that the use of interactive DCTM in online independent learning is appropriate for students to direct their learning, for teachers to control their students' learning, and for parents to guide their children to study at home. The results of the analysis of the data from the three questionnaires indicate that interactive DCTM can increase the intensity of student involvement in lessons, make lessons more interesting, make students more productive, make lessons easier to understand, make it easier for teachers to direct their students' learning, make it easier for parents to guide their children, and improve the achievement of student learning outcomes. These statements are in line with the results of several studies on the effects of using digital comics which were investigated in terms of different variables (İlhan G. O. & Oruc, S. 2019; McNicol, 2017).

The intensity of the involvement of students in the learning process increases because the presentation of teaching materials in the form of digital comics can trigger the involvement of their imaginations. The presentation of teaching materials in the form of colorful and contextual image visualizations combined with short narratives in a storyline that is not boring and in context can hypnotize them to be more involved in the storyline presented in the comics. In the comics developed in this study, instrumental music was also integrated which was selected according to the age of the students, which turned out to help their minds to be more carried away by the presentation of teaching materials that were packaged in the form of stories. Even the presentation of teaching materials in the form of comics can encourage the imagination of students to become comic writers (Vassilikopoulou et al., 2011). The findings of this study illustrate the importance of elementary school teachers to develop teaching materials that are packaged by themselves and adapted to the characteristics of elementary school-aged children. This study suggests that the teaching materials in question be designed and packaged in the form of interactive digital comics, which are equipped with interactive practice questions and are linked to other relevant learning resources.

The discussion of the research results as described above gives confidence to the researcher that the interactive DCTM theme 1 on "Movement Organs of Animals and Humans" sub-theme 2 on "Humans and the environment" for elementary school grade V semester 1 which was developed in this development research meets the criteria for use in learning practice. The findings of this study also signal the importance of developing interactive DCTM for all themes and sub-themes at each grade level in elementary schools that are adapted to the age of the students. Based on the findings of this study, it is suggested: First, teaching materials for elementary schools should be designed and packaged in the form of interactive digital comics to attract interest and motivate students to learn. Second, teachers and other researchers are advised to develop interactive DCTM for all themes and subthemes at each grade level in elementary schools that are adjusted to the age of students. Third, the principal of each elementary school is advised to develop a capacity building system for teachers related to digital literacy and competence in the field of ICT.

4. CONCLUSION

This study resulted in two conclusions: First, interactive DCTM can increase the intensity of student involvement in learning, assist teachers in directing and controlling student learning activities, and help parents guide their children in learning at home. Second: the interactive use of DCTM in online independent learning, has been proven to be effective in improving student learning outcomes than using conventional textbooks.

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The Impact of the Discovery Learning Model on Problem-Solving Ability and Scientific Attitude of Elementary School Teacher Education Students

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ABSTRAK

Kemampuan ataupun keterampilan yang seharusnya dapat dimiliki dalam pembelajaran IPA menjadi kurang maksimal untuk dikembangkan karena adanya pandemi Covid-19. Penelitian ini bertujuan untuk menganalisis pengaruh penerapan model pembelajaran Discovery Learning terhadap kemampuan memecahkan masalah dan sikap ilmiah mahasiswa pendidikan guru sekolah dasar pada pembelajaran IPA. Jenis penelitian ini merupakan penelitian quasi eksperimen dengan desain penelitian non-equivalent control group design. Populasi yang digunakan dalam penelitian ini adalah mahasiswa Program Studi Pendidikan Guru Sekolah Dasar semester genap berjumlah 78 mahasiswa. Pengumpulan data menggunakan metode tes, dengan instrumen berupa soal tes berbentuk essay test untuk menguji kemampuan memecahkan masalah serta lembar observasi untuk mengetahui sikap ilmiah. Teknik analisis data dengan menggunakan uji analisis deskriptif, normalitas, homogentias, uji hipotesis, dan uji Manova. Hasil penelitian menunjukkan bahwa skor rata-rata sikap ilmiah mahasiswa kelas eksperimen lebih tinggi daripada skor rata-rata kemampuan memecahkan masalah dan skor rata-rata sikap ilmiah kelas kontrol. Dengan demikian, dapat disimpulkan bahwa model pembelajaran Discovery Learning mempunyai pengaruh terhadap kemampuan memecahkan masalah dan sikap ilmiah mahasiswa pendidikan guru sekolah dasar dalam Pembelajaran IPA.

ABSTRACT

The abilities or skills that should be possessed in science learning have become less than optimal due to the Covid-19 pandemic. This study aims to analyze the effect of the application of the Discovery Learning model on the problem-solving abilities and scientific attitudes of elementary school teacher education students in science learning. This type of research is quasi-experimental with a non-equivalent control group design. The population used in this study were students of the even semester Elementary School Teacher Education Study Program, totaling 78 students and collecting data using the test method, with instruments in the form of test questions in the form of essay tests to test problem-solving skills and observation sheets to determine scientific attitudes. The data analysis technique used descriptive, normality, homogeneity, hypothesis, and Manova tests. The results showed that the average score of the scientific attitude of the experimental class students was higher than the average score for problem-solving skills and the average score of the control class. Thus, it can be concluded that the Discovery Learning model influences problem-solving abilities and scientific attitudes of elementary school teacher education students in science learning.

1. INTRODUCTION

The rapid development of the 21st century makes all areas of human life will lead to the use of technology, computerization, and communication (Fitriani et al., 2020; Susilo & Sarkowi, 2018). It requires education as one of the most important fields in life to develop according to the pattern of human life, which is always based on technology (Heryana et al., 2020; Rozi & Hanum, 2019). So, in this case, learning activities must be designed according to the needs of the 21st century (Supardi, 2017). One of the subjects that can meet the needs of 21st-century learning is science subjects. Science is part of the organized science of the universe and can be learned through a combination of active thinking processes and scientific attitudes that are studied specifically in formal schools (Juniati & Widiana, 2017; Lestari, 2018; Lusidawaty et al., 2020; Saputri & Djumhana, 2020). It shows that science learning is related to how to find out about nature systematically. Hence, science is not only mastering a collection of knowledge in the form of facts, concepts, or principles but also emphasizes the process of learning (Pratiwi & Aminah, 2019; Rahmi, 2017; Ramlawati et al., 2017).

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Science learning cannot be understood through memorization or just listening to lecturers' explanations related to concepts or theories. Students themselves must also carry out learning through experimentation, observation, and active experimentation, which will eventually form creativity and awareness to maintain and improve natural phenomena that occur for the better. Then form a scientific attitude that can be useful in helping to maintain the balance of nature in a good and sustainable manner (Aditia et al., 2018; Marudut et al., 2020; Novi et al., 2021; Sulthon, 2017). Thus, learning science, in principle, contains three main elements, namely the ability or skill to express scientific knowledge, scientific attitudes, and scientific knowledge as a result of searching in science (Agustiana et al., 2020; Nuraini & Waluyo, 2021; Saputri & Djumhana, 2020).

The abilities or skills that must be possessed in science learning are the ability to solve problems, critical thinking skills, science process skills, scientific attitudes, the ability to ask questions, and others (Agustina et al., 2021; Juita, 2019; Wijanarko, 2017). Given that science is a way to express scientific knowledge, the ability to solve problems is one of the basic aspects that need to be possessed in science learning (Warsiki, 2018). The ability to solve problems is a process to eliminate differences or discrepancies that occur between the results obtained and the desired results (Rahayu et al., 2021). In addition, the ability to solve problems is a process that requires logic to find a solution to a problem (Prastiwi & Nurita, 2016). In addition, the problem-solving ability is also one of the important abilities that students must have because, in everyday life, every individual will always be encountered various problems that must be solved and require creativity to be able to find solutions to the problems faced (Sumiantari et al., 2019). Thus, the ability to solve problems is the most important aspect to be trained in students as a provision for them later in dealing with real problems in everyday life (Mamin et al., 2018).

Another aspect that determines the success of science learning is the scientific attitude possessed by students. A scientific attitude is an attitude aimed at achieving objective knowledge. Scientific attitude is also defined as individual behavior when solving a problem through systematic scientific steps (Ardiansyah & Arda, 2020; Kusherawati et al., 2020). The scientific attitude itself is divided into two types, namely emotional attitude, which consists of curiosity; perseverance; acceptance of failure; open-minded; and cooperation with other people, as well as an intellectual attitude consisting of an attitude of wanting to get reliable sources, doubting, avoiding broad generalizations when the evidence is insufficient; respect other opinions; not easy to believe without evidence; and open to accept the truth (Putra et al., 2019; Rahmah et al., 2019; Saputri & Djumhana, 2020). It means that scientific attitudes can be a record of thinking that creates research tendencies towards integration in higher-order thinking skills such as critical thinking, creativity, metacognition, problem-solving, and decision making, and greatly determines the quality of individual students (Agustina et al., 2021; Ulfa, 2018).

It's just that the reality on the ground shows that the skills that should be possessed in science learning are less than optimal to be developed due to the Covid-19 pandemic. In science learning, designs made by lecturers to help optimize students' abilities and skills are less than optimal because many considerations need to be adjusted between science learning needs and students' learning needs during this online learning activity. It is based on the results of interviews with science lecturers who stated that due to online learning, the science skills or abilities that should be possessed and then developed by students are not optimal due to various limitations that arise in online learning. And if allowed to continue, this will certainly impact the decline in student learning outcomes.

The application of learning models is one way that can be used to streamline a learning process to achieve the planned goals so that the accuracy and suitability of the selection of learning models with the material and objectives to be achieved are the most important factors. The discovery learning model is a learning model that can be applied to assist the formation or development of problem-solving skills and scientific attitudes in science learning (Saleha & Nadar, 2021; Syazali & Umar, 2022; Tyas et al., 2020). The Discovery learning model is a learning model that emphasizes the learning process that is given as a whole but involves students in organizing and developing knowledge and skills to solve problems (Ana, 2019; Rita, 2022; Winoto & Prasetyo, 2020). The advantages of using the discovery learning model in the learning process are that it can help improve and enhance cognitive skills and processes; The knowledge gained through this model is very personal and powerful because it strengthens understanding, memory, and transfer; Can improve the ability to solve problems; Help reinforce concepts; and Encouraging intuitive thinking processes and formulating their hypotheses (Salmi, 2019). Thus, applying the discovery learning model can optimize individual discovery abilities while also helping learning conditions that were initially passive to become more active and creative so that they can change learning that was originally teacher-oriented to student-oriented (Ana, 2019).

Several studies that have been conducted previously revealed that there was an effect of using discovery learning models on student learning outcomes on the Mushroom concept, an increase in learning outcomes due to the learning process emphasizing students to learn actively in understanding the concepts

learned through data collection activities accompanied by with group discussions so that a discovery process occurs in the surrounding environment and is supported by literature studies which will indirectly help optimize the creativity of students in the problem-solving process (Ali & Setiani, 2018). Other studies also revealed that the learning outcomes of students who were given treatment through a discovery learning model using video media increased more than before the treatment was given. Learning through the discovery learning model provides opportunities for students to be more confident and active in the learning process and develop students abilities to solve problems and make decisions so that students have an interest in learning (Rahmayani et al., 2019). Based on some of the results of these studies, it can be said that the discovery learning model significantly influences learning outcomes and increases student learning skills. In previous research, there has been no study on the effect of the discovery learning model on problem-solving abilities and scientific attitudes of elementary school teacher education students. So the researchers focused on the study to know the significant differences in problem-solving abilities and scientific attitudes between experimental class students (IPA-A6) who were taught by discovery learning models and control class students (IPA-A7) who were taught by direct learning.

2. METHOD

This research belongs to the type of quantitative research with quasi-experimental methods. The research design used is the Non-Equivalent Control Group Design. The number of classes that became the research sample was two classes. One experimental class (IPA-A6 class) totaled 38 students who were taught using the Discovery Learning learning model, and the control class (IPA-A7 class) consisted of 40 students as a class taught using a direct instruction model. Data collection techniques in this study are test techniques to obtain data on problem-solving abilities and observation techniques to measure students' scientific attitudes. The research instrument used is the instrument of problem-solving ability and scientific attitude of students in science learning. The data obtained in the study were then analyzed by testing the research hypothesis, namely the Multivariate Analysis Of Variance (Manova) test. Several requirements must be met before testing the hypothesis. The analyzed data must be normally distributed, and the analyzed data are homogeneous. Both of these prerequisites must be met and proven beforehand. It is necessary to carry out a prerequisite analysis test, namely the normality and homogeneity tests. Normality test using SPSS 26.0 for windows Shapiro Wilk statistical test at a significance of 0.05. While the homogeneity of variance test in this study was carried out using Levene's Test of Equality of Error Variance test with the help of SPSS through the Box's M test.

All hypotheses were tested using Multivariate Analysis Of Variance (Manova). The first hypothesis and second hypothesis were carried out with the F test of variance through Manova analysis using the Test of Between Subject Effect with the test criteria for a significance level of F = 5%, which was assisted by SPSS 26.0 for windows. While hypothesis 3, carried out by F test through decisions taken by analysis of Pillae Trace, Wilk Lambda, Hotelling's Trace, Roy's Largest Root, with test criteria significance level F = 5%. If the significant number of Fcount is less than 0.05, the null hypothesis (H0) is rejected, and the alternative hypothesis (Ha) is accepted.

3. RESULT AND DISCUSSION

Result

The data obtained in this study are grouped into problem-solving skills taught using the Discovery Learning learning model, scientific attitudes taught using the Discovery Learning learning model, problem-solving skills taught by educator-centered learning, and scientific attitudes of problems taught by educator-centered learning. The recapitulation of the data analysis can be seen in Table 1.

Table 1. Recapitulation of the Results of the Calculation of the Problem-Solving Ability Score and Scientific Attitude

Statistic	A6		A7	
	Y1	Y2	Y1	Y2
Number of Respondents	33	33	33	33
mean	75.45	60.06	84.33	79.58
Standard Deviation	8.807	10.683	5.829	5.948
variance	77.568	114.121	33.979	35.377
Minimum Score	60	44	70	61
Maximum Score	92	80	98	87

Description :
A6Y1 : The results of the problem-solving ability of the experimental class
A7Y1 : The result of control class problem-solving ability
A6Y2 : The results of the scientific attitude of the experimental class
A7Y2 : The results of the scientific attitude of the control class

Based on Table 1. It can be seen that the experimental class's average score of the problem-solving ability is greater, namely 75.45, than the average score of the control class, which is 60.06. Likewise, the experimental class's average score of scientific attitudes is 84.33, which is higher than the average score of scientific attitudes in the control class, 79.58. The normality test and homogeneity test are prerequisite tests that must be carried out before testing the hypothesis. The data normality test was carried out to measure whether the data obtained and analyzed were normally distributed or not, so they could be used in parametric statistics. The normality test is carried out using Shapiro Wilk, then what is seen is the score of Shapiro Wilk and his Asymp.Sig. The normality test can be accepted if it meets the criteria for the calculation results' significance score greater than α = 0.05, then the distribution is declared normal. The summary of the normality test can be seen in Table 2.

Table 2. Normality Test Results

Indicator	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
experimental class problem-solving skills	IPA-A6	0.152	33	0.052	0.959	33	0.238
control class problem-solving ability	IPA-A7	0.133	33	0.148	0.944	33	0.090
experimental class scientific attitude	IPA-A6	0.114	33	0.200	0.969	33	0.443
control class scientific attitude	IPA-A7	0.134	33	0.137	0.909	33	0.009

Based on the summary of the data in Table 2 above, the result is that the significance score of the normality test is greater than α = 0.05. It means that it can be concluded that overall, the data obtained in the control and experimental groups are normally distributed. Furthermore, this study also carried out the homogeneity of variance test, namely the variance between the experimental and control groups. The homogeneity of variance test in this study was carried out using Levene's Test of Equality of Error Variance test with the help of SPSS through the Box's M test. The complete homogeneity test calculation results are presented in Table 3.

Table 3. Results of The Homogeneity of Variance

Box's Test of Equality of Covariance Matrices[a]	
Box's M	2.268
F	0.730
df1	3
df2	7.373
Sig.	0.534

Based on the summary of the data in Table 3 above, it can be seen that the Box's M score produced is 2.268 (p = 0.534), where the score is 0.534 > 0.05, so it can be concluded that the covariance matrix between groups is assumed to be the same or homogeneous. Based on the summary of the prerequisite tests for data analysis, it was found that the post-test results of the control and experimental groups were normal and homogeneous. After obtaining the results of the prerequisite test of data analysis, it is continued with testing the research hypothesis. From the results of data processing on hypotheses 1 and 2, the variance F test was carried out through Manova analysis using the Test of Between Subject Effects with the test criteria for a significance level of F = 5%, if the significance number Fcount is less than 0.05 then H0 is rejected, and Ha is accepted. The results of processing the test data are presented in Table 4.

Table 4. The results of the variant F test using the Test of Between Subject Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Problem-solving ability	3910.061	1	3910.061	40.796	0.000	0.389
	Scientific attitude	373.470	1	373.470	10.770	0.002	0.144
Intercept	Problem-solving ability	303011.879	1	303011.879	3.161	0.000	0.980
	Scientific attitude	443292.136	1	443292.136	1.278	0.000	0.995
Class	Problem-solving ability	3910.061	1	3910.061	40.796	0.000	0.389
	Scientific attitude	373.470	1	373.470	10.770	0.002	0.144
Error	Problem-solving ability	6134.061	64	95.845			
	Scientific attitude	2219.394	64	34.678			
Total	Problem-solving ability	313056.000	66				
	Scientific attitude	445885.000	66				
Corrected Total	Problem-solving ability	10044.121	65				
	Scientific attitude	2592.864	65				

Based on the data processing results in Table 4, it can be described as follows: First Hypothesis, the calculated F score is 40.796, df = 1, and sig = <0.05. It means that the results obtained have a significance of <0.05, so it can be concluded that the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted. Thus, based on the analysis of the first hypothesis, there is a significant difference in problem-solving abilities between control class students (IPA-A7) who were taught by direct learning and experimental class students (IPA-A6) who the Discovery Learning learning model taught. Furthermore, in the second hypothesis, the results obtained indicate that the calculated F score is 10,770, df = 1, and sig = <0.05. It means that the results obtained have a significance of <0.05, so it can be concluded that the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted. Thus, based on the results of the second hypothesis analysis, there is a significant difference in scientific attitudes between control class students (IPA-A7) who were taught by direct learning and experimental class students (IPA-A6) who the Discovery Learning learning model taught. In the third hypothesis, the F test was carried out through the decisions taken by the analysis of Pillae Trace, Wilk Lamda, Hotelling's Trace, and Roy's Largest Root, with the test criteria of significance level F = 5%. If the significant number of Fcount is less than 0.05, the null hypothesis (H0) is rejected, and the alternative hypothesis (Ha) is accepted. The results of the test calculations are presented in Table 5.

Table 5. Multivariate Test Results

Multivariate Tests

	Score	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	0.439	24.648	2.000	63.000	0.000	0.439
Wilks' lambda	0.561	24.648	2.000	63.000	0.000	0.439
Hotelling's trace	0.782	24.648	2.000	63.000	0.000	0.439
Roy's largest root	0.782	24.648	2.000	63.000	0.000	0.439

Based on the summary of the data in Table 5 above, it can be seen that the results of the study indicate that the score of F count = Pillae Trace (F count = 24,648), Wilk Lamda (F count = 24,648), Hotelling's Trace (F count = 24,648), Roy's Largest Root (F count = 24,648) = 24,648), all of which have a significance of <0.05 so that the null hypothesis (H0) is rejected. The alternative hypothesis (Ha) is accepted. Thus, from the analysis of the third hypothesis, there is a significant difference in problem-solving abilities and scientific attitudes between experimental class students (IPA-A6) who were taught by the discovery learning model and control class students (IPA-A8) who were taught by direct learning.

Discussion

Three main findings were obtained based on the research analysis results. The first finding shows a significant difference in problem-solving ability between control class students (IPA-A7) who are taught by direct learning and experimental class students (IPA-A6) who the Discovery Learning learning model teaches. It can then be described that the Discovery Learning learning model has an effective influence so that it can optimize students' problem-solving abilities in the science learning process (Fadillah et al., 2021; Jannah et al., 2022; Siswanti, 2019). It is because the learning process with the Discovery Learning model involves students actively understanding the concepts and principles of science learning, where the learning characteristics of this are in the form of proposing problems to students (Dwi et al., 2020; Septiyowati & Prasetyo, 2021). The problems given can train students in making problem-solving habits that will affect the students' high-level abilities (Bahtiar et al., 2022). The ability in question, for example, familiarizes students to think creatively by exploring and expressing ideas and identifying problem-solving that can be applied to solve the given problem (Supiandi et al., 2016). Discovery learning helps students to improve and enhance skills as well as cognitive processes, as well as improve students' ability to solve problems (Agung & Sutji, 2022; Winangun, 2020). There is an effect of using Discovery Learning on students' problem-solving abilities. It happens because students better understand, plan, solve problems according to plan, and re-check or interpret solutions in the Discovery Learning learning model.

The second finding shows significant differences in scientific attitudes between control class students (IPA-A7) taught by direct learning and experimental class students (IPA-A6) taught by the Discovery Learning learning model. These results then confirm that the Discovery Learning learning model has an effective influence so that it can optimize students' scientific attitudes in the science learning process. It is because the learning process with the Discovery Learning model can facilitate students to develop their scientific attitudes (Khofiyah et al., 2019; Winoto & Prasetyo, 2020). The Discovery Learning model also encourages students to work independently or in groups to authentically construct information that comes from concrete problems in everyday life. The learning process that applies the discovery learning model will focus on finding problems (learning resources) that come from individual concrete experiences (Asmarani et al., 2017). So that the scientific attitude of students can be formed because the discovery learning model conditions students with personal experience (Patrianingsih *et al*., 2017). The influence of the application of the Discovery Learning learning model on students' scientific attitudes is caused because scientific attitudes cannot be taught but must be developed by students actively through exploring and collaborating activities to achieve an understanding of natural phenomena to solve everyday problems.

The third finding revealed a significant difference in problem-solving abilities and scientific attitudes between experimental class students (IPA-A6) taught by the discovery learning model and control class students (IPA-A8) taught by direct learning. Based on the data from the research, descriptively, it can be stated that the Discovery Learning learning model has an effective influence that it can optimize the problem-solving ability and scientific attitude of students in the science learning process (Ana, 2019; Rita, 2022; Winoto & Prasetyo, 2020). This can be realized because the Discovery Learning learning model directs students to build their knowledge by experimenting and then finding out or finding a principle from the results of the experiment (Salmi, 2019). This means that every student is an active actor in the process of teaching and learning activities through their efforts to build knowledge independently based on the experiences they have had or obtained.

The results obtained in this study are in line with the results of previous studies, which also state that there is an effect of using the discovery learning model on student learning outcomes on the Mushroom concept, an increase in learning outcomes because the learning process emphasizes students to learn actively in understanding the concepts used. Studied through data collection activities accompanied by group discussions so that a discovery process occurs in the surrounding environment and is supported by literature studies that will indirectly help optimize students' creativity in problem-solving (Ali & Setiani, 2018). Other studies also revealed that the learning outcomes of students who were given treatment through a discovery learning model using video media increased more than before the treatment was given. Learning through the discovery learning model provides opportunities for students to be more confident and active in the learning process and develop students' abilities to solve problems and make decisions so that students have an interest in learning (Rahmayani et al., 2019). So based on some of the results of these studies, it can be proven that the application of the Discovery Learning learning model influences the ability to solve problems and students' scientific attitudes together. Thus, it can be concluded that the Discovery Learning learning model implemented by the lecturer will greatly affect the problem-solving ability and scientific attitude of students and can optimize the problem-solving ability and scientific attitude.

4. CONCLUSION

Based on the results of the research and discussion, it can be concluded that there are significant differences in problem-solving abilities and scientific attitudes between experimental class students who the Discovery Learning learning model taught and control class students who are direct or educator-centered learning models taught. It can be seen from the average score of problem-solving ability that the average score of the scientific attitude of experimental class students is higher than the average score of problem-solving ability and the average score of the scientific attitude of the control class. Thus, it can be concluded that the Discovery Learning learning model influences the problem-solving ability and scientific attitude of UPY PGSD students in science learning.

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The Impact of the Problem-Solving Model in Social Studies Learning on Social Sensitivity of Elementary School Teacher Education Students

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ABSTRAK

Mahasiswa dan siswa sebagai status pelajar seharusnya memiliki kepekaan terhadap masalah-masalah yang muncul dalam masyarakat, terutama yang terkait dengan bidang yang menjadi pilihannya. Penelitian ini bertujuan untuk menganalisis pengaruh model problem solving terhadap kepekaan sosial pada mahasiswa Pendidikan guru sekolah dasar. Penelitian ini menggunakan pendekatan deskriptif kuantitatif. Pengumpulan data dilakukan dengan menggunakan instrument berupa kuesioner. Kuesioner tersebut menggunakan skala likert Likert 1-5. Subjek dalam penelitian ini berjumlah 61 orang. Proses analisis data dilakukan dengan menggunakan analisis regresi linier berganda, yang didahului dengan uji prasyarat analisis. Menurut temuan penelitian ini, tidak semua proksi keterampilan pemecahan masalah mempengaruhi kepekaan masalah sosial mahasiswa IPS hanya focus, reason, situation dan overview berpengaruh terhadap kepekaan masalah sosial sedangkan variable inference dan claritu secara parsial tidak berpengaruh terhadap masalah kepekaan sosial. Namun, secara simultan seluruh variabel tersebut berpengaruh terhadap kepekaan masalah sosial mahasiswa IPS. Berdasarkan hal tersebut, disarankan untuk penelitian selanjutnya dapat mengkaji komponen-komponen yang mempengaruhi kepekaan masalah sosial sehingga dapat diketahui variabel lain yang berpengaruh terhadap kepekaan masalah sosial.

ABSTRACT

Students and students as student statuses should have sensitivity to problems that arise in society, especially those related to their chosen field. This study aims to analyze the effect of problem-solving models on social sensitivity in elementary school teacher education students. This study uses a quantitative descriptive approach. Data was collected using an instrument in the form of a questionnaire. The questionnaire uses a Likert Likert scale of 1-5. Subjects in this study amounted to 61 people. The data analysis process was carried out using multiple linear regression analysis, which was preceded by a prerequisite analysis test. According to the findings of this study, not all proxies of problem-solving skills affect the social problem sensitivity of social studies students. Only focus, reason, situation, and overview affect the sensitivity to social problems, while the inference and clarity variables partially do not affect the problem of social sensitivity. However, simultaneously all of these variables affect the sensitivity to social problems of social studies students. Based on this, it is recommended for further research to examine the components that affect sensitivity to social problems so that other variables that affect sensitivity to social problems can be identified.

1. INTRODUCTION

A good education will impact the quality of human resources (Hasanah et al., 2021). Education is one measure of the quality of a nation's life. It is because the level of education can indicate the quality of the resources possessed by a nation (Muspita & Sholihah, 2019; Puspitasari et al., 2021). The rapid development of science and technology is slowly changing the order of life in terms of economy, politics, culture, and even education (Kurniawatik et al., 2021; Shodiq, 2021). Education that functions as a medium for inculcating noble attitudes and character that is full of human values so that in its implementation, education does not only improve students' academic abilities but also seeks to increase the social sensitivity of each student (Hanipah & Dewi, 2022; Santika, 2021). Social sensitivity can be interpreted as a person's reaction to react quickly and precisely to objects or social situations in the surrounding environment (Anggraini, 2020; Heiriyah & Hayati, 2020). Therefore, social sensitivity must be developed, especially in addressing social problems that occur in the community (Pertiwi et al., 2020; Pitoweas et al., 2020; Wijayanti, 2019). Students and students as student statuses should have sensitivity to problems that arise

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in society, especially those related to their chosen field. He must identify problems appropriately by thinking critically and creatively and conducting analysis or research to find alternative solutions to the problem (Sueca, 2019). There are two alternative types or categories for social sensitivity: empathy is a response to behavior, actions, or sentences that are by what others expect, and social care is an interest in wanting to help others (Sutarna, 2019). This social sensitivity is shown through the level of awareness of the social environment which ultimately shapes their level of social awareness. This increase in social sensitivity can be trained and learned through the social studies learning process (Hilmi, 2017).

Social Studies contains a collection of concepts from a combination of social science and other disciplines based on educational principles (Kusuma & Rahmawati, 2019; Rismayani et al., 2020). Social Studies is a field of knowledge and analysis of social phenomena and problems to find solutions (Ollila & Macy, 2019; Whitlock & Brugar, 2019). So social studies learning in schools is focused on the information, attitudes, and abilities related to various social problems that occur around students (Adela & Permana, 2020; Azis et al., 2020). Social studies as a subject at the basic education level to tertiary institutions are integrated based on social realities and phenomena that embody an interdisciplinary approach from aspects and branches of the social sciences. (Febriani, 2021; Hidayat, 2017). Social studies learning is carried out to develop responsible ways of thinking, acting, and behaving as individuals, citizens, citizens, and citizens of the world, as well as to increase students' knowledge and understanding of their social position, rights, and obligations as citizens (Rahmawati & Zidni, 2019; Rhomadhon et al., 2016). Another goal of social studies education is to help students learn to use problem-solving thinking to solve any situation they encounter (Umbara et al., 2020; Utomo et al., 2021).

The reality shows that the sense of caring for fellow human beings is decreasing. Humans are increasingly not thinking about what happens to their social environment. There is also learning that shows a decrease in social sensitivity attitudes, such as a lack of socialization in learning. Students tend to be passive, marked by students who tend to be silent without issuing arguments or opinions. There is no interaction during the discussion process. It creates social problems. In addition, social studies learning is still teacher-centered. It is because lecturers still tend to use conventional learning methods and many learning materials are difficult for students to understand. Such conditions certainly make the learning process only controlled by educators.

One of the efforts that can be made to overcome these problems is to apply appropriate learning models, such as problem-solving learning models. Problem-solving is a process taken by someone to solve a problem (Atsnan & Yuliana, 2018; Maesari et al., 2020; Nababan, 2020). These problems need to be solved, among others, by preparing students to have social skills as citizens through innovative learning models, namely creative problem solving (Fahmi, 2016; Nana, 2018). With the problem-solving learning model, students are faced with various problems that will make students try to connect the knowledge they already have so that it will make it easier for students to face situations that are full of various problems that must be solved (Erika et al., 2021; Khoeriyah & Ahmad, 2020). Problem-solving can also improve students' knowledge, skills, abilities, and other components (Setyoko et al., 2017). The characteristics of the problem-solving learning model are that the learning process begins by asking questions or problems, focuses on inter-discipline linkages, requires children to conduct authentic investigations to find solutions to real problems, and produce certain products in the form of real works and demonstrations that explain or represent the form of problem-solving they find (Argusni & Sylvia, 2019; Munira et al., 2018; Utami et al., 2017).

Several previous studies have revealed that learning carried out with problem-solving models can significantly improve student achievement (Manik, 2020). Other studies also reveal that the Problem Solving learning model can improve students' mathematical problem-solving skills on whole number arithmetic operations in fourth-grade elementary school (Maesari et al., 2020). Similar research also reveals that the use of the Problem Solving model has a significant effect on improving students' science learning outcomes (Harefa, 2020). Based on several previous research results, it can be said that using problem-solving learning models can significantly improve student activities and learning outcomes. In previous research, there has been no study on the effect of problem-solving models in social studies learning on the social sensitivity of elementary school teacher education students. So this research focuses on how problem-solving models affect social sensitivity in elementary school teacher education students.

2. METHOD

This research is classified as quantitative descriptive research concentrating on numerical data (numbers) and statistical methods (Shodiq, 2021). Quantitative research tests hypotheses and provides facts, statistics, and relationships between variables. The subjects involved in this study were 61 students. Data collection in the study was carried out using the test method, with the research instrument in the form

of a questionnaire. The questionnaire uses a Likert Likert scale of 1-5. The data obtained in the study were then analyzed using multiple linear regression analysis, which was preceded by a prerequisite analysis test. Research on the analysis of problem-solving models begins with testing the data quality assessed using validity and reliability tests. The validity of a research instrument can be tested using Pearson correlation; if the score of r count > r table, the item on the instrument is valid. On the other hand, if the score of calculated r and table r is zero, then the item on the instrument is invalid. The p-score can also be used to determine validity. If the p-score of each statement is less than 0.05, then the research instrument is valid. Cronbach's alpha model can be used to calculate the reliability coefficient. If the score of Cronbach's alpha is 0.60, the data is considered very good.

3. RESULT AND DISCUSSION

Result

The results of the validity and reliability of the instrument are shown in Table 1.

Table 1. Validity and Reliability Test Results

No.	*Pearson Correlation*	Significance	Description	CronbachAlpha	Description
			Focus		
1.	0.766	0.000	Valid		
2.	0.687	0.000	Valid		
3.	0.589	0.000	Valid		
4.	0.727	0.000	Valid	0.857	Reliable
5.	0.779	0.000	Valid		
6.	0.814	0.000	Valid		
7.	0.504	0.000	Valid		
8.	0.858	0.000	Valid		
			Reason		
9.	0.700	0.000	Valid		
10.	0.824	0.000	Valid	0.852	Reliable
11.	0.747	0.000	Valid		
12.	0.567	0.000	Valid		
13.	0.644	0.000	Valid		
14.	0.864	0.000	Valid		
15.	0.816	0.000	Valid		
			Inference		
16.	0.701	0.000	Valid		
17.	0.828	0.000	Valid	0.809	Reliable
18.	0.867	0.000	Valid		
19.	0.816	0.000	Valid		
			Situation		
20.	0.800	0.000	Valid		
21.	0.815	0.000	Valid	0.740	Reliable
22.	0.617	0.000	Valid		
23.	0.806	0.000	Valid		
			Clarity		
24.	0.632	0.000	Valid		
25.	0.609	0.000	Valid	0.690	Reliable
26.	0.724	0.000	Valid		
27.	0.774	0.000	Valid		
28.	0.617	0.000	Valid		
			Overview		
29.	0.797	0.000	Valid		
30.	0.818	0.000	Valid	0.671	Reliable
31.	0.734	0.000	Valid		
			Peer Relation Skill		
32.	0.608	0.000	Valid		
33.	0.638	0.000	Valid	0.750	Reliable
34.	0.695	0.000	Valid		
35.	0.842	0.000	Valid		

No.	*Pearson Correlation*	Significance	Description	CronbachAlpha	Description
36.	0.752	0.000	Valid		
		Learning Self-Control and Self Direction			
37.	0.586	0.000	Valid		
38.	0.847	0.000	Valid		
39.	0.760	0.000	Valid	0.830	Reliable
40.	0.871	0.000	Valid		
41.	0.669	0.000	Valid		
42.	0.577	0.000	Valid		
43.	0.682	0.000	Valid		
		Sharing Ideas and Experience			
44.	0.932	0.000	Valid		
45.	0.894	0.000	Valid	0.776	Reliable
46.	0.623	0.000	Valid		
47.	0.645	0.000	Valid		

The data in Table 1 shows the score of sig < 0.05 and the score of Cronbach's alpha > 0.60, indicating that the data in this study are valid and reliable. The analysis then continued with the normality test of the data used to see whether the regression model's residual variables (confounding) were normally distributed. A graph shows the normality test with the dots around the diagonal line. In the PP Normal Plot Figure, the dots are around the diagonal line, indicating that the data in this investigation are consistent with the premise of data normality. The multicollinearity test in this research is used to determine whether the independent variable (independent) of the regression model has a relationship or not. If there is a relationship between independent variables, this variable is considered not orthogonal, and the regression model is considered inadequate. The tolerance score and the variance inflation factor can be used to see the multicollinearity test in the regression model (VIF). (VIF = 1/tolerance) A high VIF score corresponds to a low tolerance score. The tolerance score > 0.10, or equal to the VIF score of 10, is the cutoff number commonly used to identify the presence of multicollinearity. The results of the multicollinearity test are presented in Table 2.

Table 2. Validity and Reliability Test Results

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Focus	0.493	2.028
Reason	0.168	5.936
Inference	0.188	5.328
Situation	0.186	5.381
Clarity	0.479	2.087
Overview	0.528	1.892

Table 2 describes the tolerance score > 0.10 and the VIF score of 10 needed to meet the multicollinearity assumption in this research model. After obtaining the results of the validity and reliability of the research, then proceed to the heteroscedasticity test, which is used to test whether the residuals of the regression model are not the same from one observation to the next. If there is no heteroscedasticity in the regression model, it is said to be very good (homoscedasticity). Many testing techniques are available, and the researcher in this study chose the Scatterplot approach. Residual spread, or points that spread out regularly but do not form a pattern or gather in one location, and whether the spread is above or below 0 (zero) on the vertical axis. The regression equation has met the requirements for the assumption of heteroscedasticity starting from 0 (zero) (Y-axis), then the multiple linear regression model does not show heteroscedasticity. The next analysis stage is testing the research hypothesis, which is carried out through the analysis of multiple linear regression equations, F test, T-test, and Coefficient of Determination Test. Processing data carried out the analysis of multiple linear regression equations through SPSS 24.0. The results of multiple linear regression analysis are shown in Table 3.

Table 3. Multiple Linear Regression Analysis Results

Variable	*Unstandardized* B	*Coefficients Std. Error*	t-count	*p-score*
(Constant)	0.090	0.107	0.847	0.401
Focus	0.563	0.078	7.253	0.000
Reason	0.430	0.048	8.894	0.000
Inference	0.015	0.049	0.310	0.758
Situation	-0.129	0.052	-25.02	0.015
Clarity	0.019	0.030	0.633	0.529
Overview	0.096	0.031	3.118	0.003
F-test			327.40	0.000
Adjusted R Square				0.970

Based on the findings in Table 3, the p-score of the t-count variables for the focus, reason, situation, and overview variables are all <0.05, while the p-score for both inference and clarity is > 0.05. It shows that partially (individually) focus, reason, situation, and overview affect sensitivity to social problems, while inference and clarity variables partially do not affect social sensitivity problems. Thus, the best effort to increase sensitivity to social problems in social studies students is to increase focus, reason, situation, and overview. However, suppose you look at the highest Beta scores. In that case, it is the focus (0.563) and reason (0.430), so this variable is the most suitable to be improved if you want to increase the sensitivity to social problems of social studies students. Furthermore, in the F test, the estimated F score is 327.40 with a significance of 0.000, indicating that attention, reason, inference, circumstances, clarity, and description influence sensitivity to social problems simultaneously. The calculated p-score F for the variables focus, reason, inference, situation, clarity, and overview is 0.000 < 0.05, implying that the variables focus, reason, inference, situation, clarity, and overview affect the sensitivity of social problems among students IPS.

The results of the t-test calculation show that: the calculated t-score of the focus variable is 7.253 with a sig score of 0.000 <0.05, this indicates that the focus variable has a positive and significant effect on the sensitivity of social problems; The explanatory variable has a t-count score of 8.894 with a sig score of 0.000 <0.05, this indicates that it has a positive and significant effect on sensitivity to social issues; The inference variable has a t-count score of 0.310 with a sig score of 0.758 > 0.05, so this indicates that it has no positive and significant effect on sensitivity to social issues; The context variable has a t-count score of -2.502 with a sig score of 0.000 which is <0.05, this indicates that it has a negative and significant effect on sensitivity to social issues; The clarity variable has a t-count score of 0.633 with a sig score of 0.529 > 0.05, this indicates that it has a positive and significant effect on sensitivity to social problems; and the t-count score of the general description variable is 3.118 with a sig score of 0.003 <0.05, this indicates that it has a positive and significant effect on sensitivity to social problems. Furthermore, in the Coefficient of Determination Test, the R Square score obtained is 0.970. These results show that problem-solving skills proxied by attention, reasoning, inference, circumstances, clarity, and description affect 97 percent of PGSD students' sensitivity to social problems. At the same time, other elements influence the remaining 3%.

Discussion

Based on the research analysis results, it is known that not all proxies of problem-solving skills affect the sensitivity to social problems of social studies students. This can be shown through the p-score of the t-count variables for focus, reason, situation, and overview, which is smaller than 0.05. In contrast, the inference and clarity variables have p-scores greater than 0.05, so it can be said that partially (individual) focus, reason, situation, and overview affect the sensitivity to social problems. In contrast, the inference and clarity variables partially do not affect the problem of social sensitivity. It can be seen from the calculated p-score F for the variables focus, reason, inference, situation, clarity, and description is 0.000. It is less than 0.05, implying that all variables, including focus, reason, inference, situation, clarity, and description, affect the sensitivity of social problems among social studies students. Social sensitivity is the behavior of someone who shows concern for the environment, such as sharing what is owned by others, helping, cooperating, being honest, generous, paying attention to the rights and welfare of others, and trusting and respecting each other (Shodiq, 2021; Wijayanti, 2019). The social sensitivity a person possesses will increase the inner drive to make a moral judgment, decision making, and moral action which is then applied in everyday life (Pertiwi et al., 2020; Pitoweas et al., 2020; Wijayanti, 2019).

Social sensitivity can be trained through social studies learning accompanied by the use of problem-solving learning models. Problem-solving is a learning model that emphasizes how students can solve existing problems (Fahmi, 2016; Nana, 2018). The purpose of using the problem-solving model is so that

students can understand the problem by scientific rules and critical thinking steps (Erika et al., 2021; Khoeriyah & Ahmad, 2020; Setyoko et al., 2017). Learning using problem-solving models is carried out by presenting subject matter that confronts students with problems that must be solved to achieve learning objectives (Argusni & Sylvia, 2019; Munira et al., 2018; Utami et al., 2017). The learning process that emphasizes problem-solving will create social sensitivity in students. The results obtained in this study are in line with the results of previous studies, which also revealed that learning carried out using a problem-solving model can significantly improve student achievement (Manik, 2020). Other studies also reveal that the Problem Solving learning model can improve students' mathematical problem-solving skills on whole number arithmetic operations in fourth-grade elementary school (Maesari et al., 2020). Similar research also reveals that the use of the Problem Solving model has a significant effect on improving students' science learning outcomes (Harefa, 2020). Based on some of the results of previous research, problem-solving learning models can significantly improve student activities and learning outcomes.

4. CONCLUSION

Based on the research analysis and discussion results, it can be concluded that not all proxies of problem-solving skills affect the social problem sensitivity of social studies students. Only focus, reason, situation, and overview affect the sensitivity to social problems, while the inference and clarity variables partially do not affect the problem of social sensitivity. However, simultaneously all of these variables affect the sensitivity to social problems of social studies students.

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Project Citizen Model in Citizenship Education and Its Impact on Critical Thinking Skills for Elementary School Teacher Education Students

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ABSTRAK

Pendidikan kewarganegaraan salah satu mata pelajaran yang berperan penting dalam menciptakan dan mewujudkan smart and good citizenship. Peserta didik diharapkan memiliki keterampilan secara intelektual dalam kehidupan berbangsa dan bernegara, kemudian pengetahuan dan keterampilannya itu akan membentuk suatu karakter pada siswa yang dijadikan sebagai kebiasaan hidupnya sehari-hari dan mencerminkan warga negara yang baik. Salah satu instructional treatment dalam pembelajaran PKn untuk mencapai tujuan-tujuan di atas adalah Project citizen. Penelitian ini bertujuan untuk menganalisis pengaruh critical thingking mahasiswa melalui penerapan model pembelajaran project citizen pada mahasiswa semester II program studi S1 Pendidikan Guru Sekolah Dasar. Penelitian ini adalah penelitian kuantitatif dengan metode quasi experiment. Penelitian dilaksanakan dengan subjek penelitian sebanyak 50 mahasiswa. Adapun teknik pengumpulan data menggunakan tes. Hasil penelitian menunjukkan bahwa penerapan model pembelajaran project citizen dengan tahapan mengidentifikasi masalah, memilih masalah sebagai bahan kajian kelas, mengumpulkan informasi, mengembangkan portofolio kelas, menyajikan portofolio, dan merefleksikan pengalaman belajar, dapat meningkatkan critical thinking mahasiswa. Hal tersebut dibuktikan dengan pengujian kelas eksperimen yang diajarkan dengan penggunaan model pembelajaran Project citizen memiliki nilai rerata yang lebih tinggi dibandingkan dengan kelas kontrol yang diajarkan dengan model konvensional.

ABSTRACT

Civic education is one of the subjects that play an important role in creating and realizing smart and good citizenship. Students are expected to have intellectual skills in the life of the nation and state, then their knowledge and skills will form a character in students which is used as a habit of daily life and reflects good citizens. One of the instructional treatments in Civics learning to achieve the above objectives is Project citizen. This study aims to analyze the effect of student critical thinking by applying the project citizen learning model to second-semester students of the Elementary School Teacher Education S1 study program. This research is quantitative research with a quasi-experimental method. The research was carried out with 50 students as research subjects. The data collection technique used a test. The results showed that applying the project citizen learning model with the stages of identifying problems, choosing problems as class study material, gathering information, developing class portfolios, presenting portfolios, and reflecting on learning experiences, can improve students' critical thinking. The test of the experimental class evidences this taught using the Project citizen learning model, which has a higher average value than the control class taught using the conventional model.

1. INTRODUCTION

Education, in general, is an attempt to civilize or glorify humans (Al-Khansa & Dewi, 2021; Pane & Dasopang, 2017). For the implementation of education properly and appropriately, we need a science that examines in-depth how education should be implemented (Sujana, 2019). Education is a communication process that contains a process of transformation of knowledge, values, and skills, both inside and outside school, in the community, in the family environment, and the learning takes place throughout life (long life learning) from one generation to generation (Setyowati, 2019; Thadi, 2019; Yuliah, 2020). Three skill units are most in-demand and important in life in the 21st century, one of which is learning and innovation skills with four aspects, including critical thinking (Astuti & Sahono, 2019). Critical thinking has been a central educational goal since 1942 (Ulfa et al., 2018; Yanizon & Adiningtyas, 2018). Critical thinking is a systematic cognitive process that is applied in assessing something to make good judgments and decisions that involve one's mental activity in collecting, categorizing, analyzing, and evaluating information or evidence to

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conclude to solve problems (Aini et al., 2019; Indayani et al., 2021; Sulaiman et al., 2019). Critical thinking skills are needed so that mastery of a concept by students not only in the form of memorizing several concepts they have learned but also apply the concepts they have in other aspects (Ritonga et al., 2020). The importance of critical thinking skills in the world of education no longer needs to be debated. Alignment of critical thinking can be trained and developed with various subjects that support the development of critical thinking because no subject specifically focuses on training students' critical thinking skills (Astuti & Sahono, 2019; Darwati & Purana, 2021; Ramdani et al., 2020). Therefore, it is important to apply it in various subjects of critical thinking skills, one of which is Citizenship Education (PKn) which in the 2013 curriculum needs to be presented and processed in an interdisciplinary manner.

However, the reality on the ground shows that Civics learning can still not maximize students' critical thinking skills. The learning provided by the lecturer does not involve students actively. In addition, students tend to be passive when the learning and discussion process takes place. Students tend only to listen and take notes on the material presented by the lecturer. Students' lack of active involvement in this learning causes a lack of student skills in critical thinking, for example, asking questions, expressing opinions, and solving problems. Students' lack of critical thinking skills in the Civics learning process, especially on State of law material, causes students to only memorize existing concepts and theories without wanting to explore further to be understood in depth. The difference in the level of critical thinking of each student is caused by many factors and can affect their learning outcomes. Therefore, a learning model with the right strategy is needed to improve critical thinking skills. One of them is the project citizen learning model.

The project citizen model is an innovative learning model that can improve students' critical thinking (Fajri et al., 2021; Iriansyah, 2020). The project citizen model is carried out through a learning approach process that helps students to find problems from real events and collect information through self-determined strategies to make problem-solving decisions which are then presented in the form of performance (Astuti & Sahono, 2019; Hakim & Pradityayudha, 2021; Widodo et al., 2018). The project citizen learning model is designed in a learning design that synergistically combines problem-solving models, social research, social involvement, group learning, simulations, deep dialogue and critical and creative thinking, value clarification, and democratic learning (Luqman, 2017; Mulyoto & Samsuri, 2017; Nusarastriya et al., 2017). This model can assist teachers in involving students in actively participating and developing critical thinking. It is because this model focuses on the involvement of students as a whole in terms of attitudes, knowledge and skills (Mariyani, 2018; Sahari & Wahyudi, 2020).

Previous studies have revealed that project citizens can develop their ability to work cooperatively, innovatively, creatively, and critically through empirical practice learning activities (Fajri et al., 2021). The results of subsequent studies also reveal the same thing. It is stated that through project citizenship, students' critical thinking skills can be significantly improved through learning outcomes issued after learning (Saylendra, 2017). Other research also reveals that the basic values of anti-corruption education will be understood directly by students when through the learning process with the project citizen model while the values that students will achieve consist of the values of honesty, caring, independence, discipline, responsibility, hardwork, modesty, courage and justice (Azmi, 2020). Based on the results of previous studies, it can be said that the application of the project citizen model significantly improves learning outcomes and social skills. However, in previous research, there has been no study on the application of the project citizen model in civic education and its impact on the critical thinking skills of elementary school teacher education students, so this research is focused on this study to know the significant differences in critical thinking skills between experimental class students taught by the project citizen learning model and control class students taught by lecture learning.

2. METHOD

This type of research is quasi-experimental with a non-equivalent control group research design. Quasi-experimental design is a design that has a control group but as a whole does not function to control external variables that meet the implementation of the experiment (Indayani et al., 2021). In this case, the experimental class was given learning treatment using the project citizen model, and the control class was not given the project citizen model. The population in this study were second-semester PGSD students at PGRI Yogyakarta University. The sample used consisted of two classes, class A7-21 as the experimental class and class A8-21 as the control class. The number of students in both classes, both experimental and control classes, was 25 students each. Data collection in the study was carried out using the method of tests, interviews, and observations with research instruments in the form of critical thinking skills tests in the form of description questions. The data obtained in the study were then analyzed by data analysis

techniques using the normality test, homogeneity test and independent samples test with the help of the SPSS application.

3. RESULT AND DISCUSSION

Result

Research on applying the project citizen model in civic education learning is carried out through univariate and inferential analysis. Univariate analysis was conducted to determine the experimental and control classes' average pretest and post-test scores. The results of the univariate analysis are presented in Table 1.

Table 1. Average and SD Student Scores

Group	Mean and Standard Deviation		
	PRE	POST	c
Experiment	48.88(11.36)	77.12(13.47)	28.24(12.45)
Control	53.12(13.25)	73.92(12.01)	20.80(12.86)

Based on table 1, the average pretest value of the experimental class is 48.88, the average post-test value is 77.12 and an increase in the value of 28.24 is obtained. Meanwhile, the control class's average pretest value was 53.12 and the post-test value was 73.92 with an average increase of 20.80. Thus, it can be concluded that the test of the experimental class taught using the Project citizen learning model has a higher mean value than the control class taught using the conventional learning model. After obtaining the results of univariate analysis, the research then proceeds to inferential analysis. Inferential analysis was carried out with normality, homogeneity, paired sample t-test, and independent-sample t-test. The normality test was conducted to determine whether the research data were normally distributed. Normal data is required before parametric statistical analysis (paired-sample t-test and independent-sample t-test). In parametric statistics, two normality tests are often used, the Kolmogrov-Smirnov test and the Shapiro-Kwilk test. The results of the pretest and post-test normality tests for the experimental and control classes can be seen in Table 2.

Table 2. Normality Test Results

Class		Kolmogorov-Smirnov[a]		Shapiro-KWilk		Distribution conclusion
		Statistic	Sig.	Statistic	Sig.	
PRE	Experimen	0.135	0.200	0.959	0.395	Normal
	Control	0.146	0.176	0.942	0.167	Normal
POST	Experimen	0.107	0.200	0.962	0.446	Normal
	Control	0.169	0.064	0.943	0.177	Normal
DIFFERENCE	Experimen	0.228	0.062	0.851	0.062	Normal
	Control	0.158	0.107	0.941	0.157	Normal

Based on the normality test results above, it is known that the significance value of the experimental class pretest data on the Kolmogrov-Smirnov test is 0.200 and the Shapiro-Kwilk test is 0.395> 0.05, so it is normally distributed. The control class data in the Kolmogrov-Smirnov test is 0.176 and the Shapiro-Kwilk test is 0.167> 0.05, so it is normally distributed. The post-test data for the experimental class in the Kolmogrov-Smirnov test is 0.200 and the Shapiro-Kwilk test is 0.446 > 0.05, so it is normally distributed. The control class post-test data on the Kolmogrov-Smirnov test was 0.064 and the Shapiro-Kwilk test was 0.177 > 0.05, so it was normally distributed. Furthermore, the data for the increase (difference) in the experimental class in the Kolmogrov-Smirnov test was 0.062 and in the Shapiro-Kwilk test it was 0.062 > 0.05. It was normally distributed. The data for the increase (different) in the control class in the Kolmogrov-Smirnov test is 0.107 and in the Shapiro-Kwilk test is 0.157> 0.05, so it is normally distributed. The homogeneity test was used to determine whether the data obtained from the two groups had homogeneous variants. The results of the homogeneity test are presented in Table 3.

Table 3. Homogeneity Test Results

	Levene Statistic	Sig.	Conclusion
Pre	0.438	0.511	Homogen
Post	0.089	0.767	Homogen
Difference	0.838	0.364	Homogen

The homogeneity test results show that the Lavene-statistical probability value > Level of significant = 0.05, then the data meets the assumption of homogeneity. Thus, the population being studied has something in common or with each other. After the homogeneity test was carried out, it was continued to the paired sample t-test. The results of the paired sample t-test test are presented in Table 4.

Table 4. Paired Sample T-Test

Group	T berpasangan		Method conclusion
	Statistic	Sig.	
Experiment	11.330	0.000	Effective
Control	0.088	0.000	Effective

The paired sample t test above shows that the experimental class obtained a sig value of 0.000 <0.05, while the control group obtained a sig value of 0.000 <0.05. Thus, it can be concluded that the experimental class Project citizen learning model and the conventional control class learning model are both effective. The independent-sample t-test was used to determine whether there was a difference in the mean of two unpaired samples. Independent sample t test to answer the formulation of the problem whether there is a difference between the use of the Project citizen learning model and the conventional learning model. In this case, it can be seen in the difference in the post-test results of the experimental class and the control class. Independent sample t-test test data are presented in Table 5.

Table 5. The Results of the Independent Sample T-Test

	Lavene Test		Independent t-test						
	F	Sig.	t	df	Sig.	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Lower
Difference	0.838	0.363	2.078	48	0.043	7.44000	3.58017	0.24159	14.63841

Based on the results of the independent sample t-test in the table above, it is known that the sig value is 0.043 <0.05. It means that there are differences in using the Project citizen learning model with conventional learning models.

Discussion

The research analysis results show that the application of the project citizen learning model with the stages of identifying problems, choosing problems as class study material, collecting information, developing class portfolios, presenting portfolios, and reflecting on learning experiences can improve students' critical thinking. The project citizen learning model provides opportunities for students to learn according to their own pace and way. Project citizen is a learning technique to inspire students in the class, which can then be used as a model of citizen behavior in everyday life (Azmi, 2020; Sutrisno, 2019). In this model, students are taught how to get problem-based knowledge by analyzing the problems around them and how to solve the problems (Oktaviarini & Jadmiko, 2018; Rubei, 2020). With the implementation of the project citizen model in Citizenship Education, students are expected to have critical thinking skills on the concept of the rule of law. It is because learning the project citizen model focuses more on strategies for understanding students with the basics of knowledge, how citizens should take citizenship responsibilities (Mulyoto & Samsuri, 2017).

The strength of using the project citizen learning model is the transfer of knowledge skills and attitudes achieved through problem-based active learning strategies to develop knowledge, skills, and democratic citizenship traits that enable and encourage student participation in government and civil society (Astuti & Sahono, 2019; Hakim & Pradityayudha, 2021; Widodo et al., 2018). The project citizen program encourages to be actively involved with government organizations and civil society to solve a problem in the school or community as well as hone a problem in the school or community as well as hone social and intellectual intelligence, which is important for responsible democratic citizenship (Luqman, 2017; Mulyoto & Samsuri, 2017; Nusarastriya et al., 2017).

The project citizen program encourages to be actively involved with government organizations and civil society to solve a problem in the school or community, hone a problem in the school or community, and hone social and intellectual intelligence, which is important for responsible democratic citizenship. The project citizen program encourages to be actively involved with government organizations and civil society to solve a problem in the school or community as well as hone a problem in the school or community as well

as hone social and intellectual intelligence, which is important for responsible democratic citizenship (Fajri et al., 2021). The results of subsequent studies also reveal the same thing. It is stated that through project citizenship, students' critical thinking skills can be significantly improved through learning outcomes issued after learning (Saylendra, 2017). Other research also reveals that the basic values of anti-corruption education will be understood directly by students when through the learning process with the project citizen model, while the values that students will achieve consist of the values of honesty, caring, independence, discipline, responsibility, hard work, modesty, courage, and justice (Azmi, 2020). Based on the results of the research, which is supported by previous studies, it can be said that the application of the project citizen learning model can significantly develop students' cognitive, affective, and psychomotor abilities.

4. CONCLUSION

Based on the research results above, this study concludes that there are differences in using the Project citizen learning model with conventional learning models. It means that the implementation of the project citizen model in civic education influences students' critical thinking skills on the concept of the rule of law.

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The Use of Quizizz Applications and Its Impact on Higher Order Thinking Skills of Elementary School Teacher Education Students in Elementary Science Learning

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ABSTRAK

Kemampuan Higher order thinking skill (HOTS) yang seharusnya berkembang pada mahasiswa semester genap PGSD dalam pembelajaran IPA mengalami kendala karena pembelajaran jarak jauh selama pandemi Covid-19. Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan aplikasi media Quizizz terhadap Higher order thinking skill (HOTS) mahasiswa PGSD pada pembelajaran IPA. Jenis penelitian adalah quasi eksperimen (eksperimen semu) dengan desain penelitian Pretest-Posttest Control Group Design. Populasi yang digunakan adalah mahasiswa PGSD semester genap kelas eksperimen A2 dan kelas kontrol A1 berjumlah 68 mahasiswa. Pengambilan sampel menggunakan teknik purposive sampling. Pengumpulan data menggunakan tes dan observasi. Instrumen yang digunakan dalam penelitian adalah soal tes berbentuk objektif. Teknik analisis data dengan menggunakan uji analisis deskriptif, uji normalitas, uji homogenitas, uji hipotesis dan uji ANOVA. Hasil penelitian menunjukkan bahwa skor rata-rata nilai hasil posttest dengan menggunakan Quizizz lebih tinggi dari pada skor hasil posttest dengan menggunakan Kahoot. Dengan demikian, dapat disimpulkan terdapat pengaruh aplikasi media Quizizz terhadap kemampuan Higher order thinking skill (HOTS) pada mahasiswa dalam pembelajaran IPA.

ABSTRACT

Higher-order thinking skills (HOTS), which should develop in even semester students of PGSD in science learning, have experienced problems due to distance learning during the Covid-19 pandemic. This study aims to analyze the effect of using the Quizizz media application on Higher order thinking skills (HOTS) of PGSD students in science learning. This type of research is a quasi-experimental (quasi-experimental) design with Pretest-Posttest Control Group Design. The population used is the even semester students of the experimental class A2 and the control class A1 totaling 68 students. Sampling using a purposive sampling technique and collecting data using tests and observations. The instrument used in the study was an objective test question: the data analysis technique used descriptive, normality, homogeneity, hypothesis, and ANOVA tests. The results showed that the average score of the post-test results using Quizizz was higher than the post-test scores using Kahoot. Thus, it can be concluded that the Quizizz media application affects students' Higher order thinking skill (HOTS) ability in science learning.

1. INTRODUCTION

Education is a place or institution in realizing the ideals of education to create a generation of quality human resources (Bahri, 2022; Saputra, 2021). It means that quality education begins with human resources by prioritizing the meaning of education (Ghofir, 2020). Education facilitates human resources in building a generation that can produce superior quality (Indrati et al., 2020). Education staff or teachers are one of the components that determine the success of a learning process. Educators can change education (Somantri, 2021; Suardipa & Handayani, 2021; Susilo & Sarkowi, 2018). Becoming a quality educator requires a learning process at the tertiary level, which will later produce knowledgeable, conversant, creative, independent, democratic, and responsible students.

One of the learning processes that can produce quality students is the science learning process which involves higher-order thinking processes. The higher-order thinking process means that the learning process is student-centered and aims to shape and build students to think critically and at a higher level. Students can apply Higher order thinking skills (HOTS) in science learning (Nur et al., 2022; Satwika et al., 2018; Wicaksono, 2022). Science learning studies phenomena or events that occur in nature (Handayani, 2018). Learning science can be done by experiment, experiment, observation, and observation of the

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occurrence of a phenomenon in biology (Guswita et al., 2018; Susanto et al., 2019). Science is developed through natural observations, laboratory experiments, and theoretical studies, so learning science follows the characteristics of science (Khery et al., 2020; Muhajir et al., 2021). Therefore, science learning is delivered not only orally and in writing in class but also involves activities in the laboratory and observations of the natural surroundings. The complex science learning process can then assist students in developing higher-order thinking skills (HOTS) (Fanani, 2018).

Higher-order thinking ability (HOTS) is a systematic thinking process that leads to the ability to apply knowledge, skills, and values in reasoning, reflection, problem-solving, decision making, innovating, and creating new things (Gradini et al., 2018; Sani et al., 2020; Saraswati & Agustika, 2020). In the learning process in the 4.0 era, students are certainly required to master higher-order thinking skills or known as High Order Thinking Skills (HOTS), because higher-order thinking is one of the stages of thinking that cannot be separated from everyday life, and every student is directed to have this high-order thinking pattern because high-order thinking skills make a person able to think critically as described by (Astini, 2020; Chotimah & Nurdiansyah, 2017). Higher-order thinking skill (HOTS) is an ability that uses a person's higher way of thinking, which is not only memorizing, remembering but students must be able to think critically and creatively so that they can solve problems by analyzing, evaluating, and creating (Hendriawan & Usmaedi, 2019; Pardede et al., 2020; Saefullah et al., 2021). So in the high-level thinking process, students must apply what they have learned and analyze, evaluate, and synthesize the knowledge they have acquired to solve problems in everyday life (Sismawarni et al., 2020; Syahri & Ahyana, 2021). The main purpose of Higher order thinking skills (HOTS) is for students to collect information, categorize it and generate new ideas to be implemented in other situations they have (Thamrin et al., 2019).

It's just that the reality on the ground shows that the High Order Thinking Skills (HOTS) owned by students are considered less than optimal because, in their daily routines, such as in lectures, they only sit, listen, and take notes and analysis, evaluation and creation activities are rarely trained on students (Yuliati & Lestari, 2018). This aligns with initial observations and interviews at PGRI Yogyakarta University in the PGSD study program. The observations and interviews show that learning science by applying the High Order Thinking Skills (HOTS) ability has experienced problems, resulting in decreased student achievement. The obstacle most experienced by lecturers is the difficulty of designing online lessons to complete the syllabus and achieving HOTS goals. At the same time, the obstacles experienced by students are the difficulty of understanding the material because the lecture process is only carried out through the process of giving assignments without any delivery of material through the media. In addition, the lack of students' ability to get used to training thinking processes is also the cause of each student's low high-level thinking skills. Students tend to want to learn practically and instantly without going through a systematic thought process. It has an impact on the learning process that is less than optimal and has an impact on decreasing students' thinking abilities.

One of the efforts that can be made to overcome these problems is by applying a learning model that can train students' higher-order thinking skills, such as quiziz learning media. Quizizz application media is a game form integrated with material or evaluation questions (Mulatsih, 2020; Mulyati & Evendi, 2020). The quiziz app can be used as an online assessment tool through multiplayer fun classroom activities and allows all students to practice with their computers, smartphones, and IPads (Purba, 2020; Suwarto, 2021). Quizizz games also have game characteristics such as avatars, themes, memes, and entertaining music in the learning process, allowing students to compete with each other and motivate them to learn so that learning outcomes can improve (Mulyati & Evendi, 2020; Pamungkas, 2020). The Quizizz media application has various interesting features and is easy to use and understand for students (Rahman et al., 2020). As for the various advantages of the Quizizz media application, the use of the Quizizz media application is quite easy. The quizzes compiled can be directly added to the Quizizz media application and can be arranged with images, backgrounds, and options of choice (Jati, 2020; Nizaruddin et al., 2021; Yana et al., 2020). Second, Quizzes can be shared with codes with students. Third, the Quizizz media application provides statistical data from students' quiz results which can be downloaded as an Excel spreadsheet. Fourth, the use of the Quizizz media application is quite flexible because there is a time set in the quizzes (Ningsih et al., 2021).

Several studies that have been carried out previously revealed that using educational media based on quizzz educational games effectively improved student learning outcomes in the tenth grade Office Technology subject (Citra & Rosy, 2020). Other studies also revealed that, in general, students considered using Quizizz to take quizzes assigned before face-to-face lectures in class, positively impacting learning activities in accounting courses. Students considered Quizizz an easy-to-use application. Its use made lectures fun, increased mastery of the material, and increased student motivation and activity in studying consolidated accounting courses (Amri & Shobri, 2020). Subsequent research also revealed the same thing, that it was stated that the quiziz educational game media could increase student activity in online learning

during the prevention of the spread of Covid-19 social studies subjects (Nurhayati, 2020). Based on several previous research results, it can be said that the use of quiziz learning application media is very effective in using the online learning process. In previous studies, no studies discussed the use of the quizizz application and its impact on the higher-order thinking skills of elementary school teacher education students in elementary science learning. So this research is focused on analyzing the effect of using the Quizizz media application on Higher order thinking skills (HOTS) of PGSD students in science learning.

2. METHOD

The type of research used is quasi-experimental, with a research design of Pretest-Posttest Control Group Design. The population in this study were all second-semester students, totaling 68 students. Sampling in the study was carried out by random sampling technique, with the research sample being students in classes A2 and A1. The control class (class A-1) is taught using conventional learning methods, and the experimental class (class A-2) is taught using Quizizz learning media. Data collection in the study was carried out using the test method, with research instruments in the form of multiple-choice pretest and post-test questions. The pretest was given before the treatment was given to the experimental class and the control class. After the treatment, a post-test was given to measure the Higher order thinking skill (HOTS). Previously, the test instrument passed validity and reliability testing by validation experts.

The data obtained in the study were then analyzed using One Way Anova. Before testing the hypothesis, several requirements must be met and need to be proven. The requirements in question are: the data analyzed must be normally distributed and know the data being analyzed is homogeneous. Both of these prerequisites must be proven first, so to fulfill this, a prerequisite analysis test is carried out by conducting a normality test and a homogeneity test. Normality test using SPSS version 23 for windows statistical test Shapiro Wilk at a significance of 0.05. While the homogeneity of variance test in this study was carried out using Levene's Test of Equality of Error Variance with the help of SPSS version 23 through the Box's M test. After the prerequisite test was carried out, it was continued by calculating the t-test, the paired sample t-test.

3. RESULT AND DISCUSSION

Result

Research on the analysis of the application of the Quizizz application media begins by carrying out an analysis of the average pretest and post-test results of students. The results of the calculations are presented in Table 1.

Table 1. The results of Calculating the Hots Ability Score

Statistic	A2		A1	
	YI	Y2	Y1	Y2
Number of Respondents	34	34	34	34
mean	66.59	73.18	56.12	58.59
Standard Deviation	12.721	9.054	12.397	11.479
variance	161.825	81.968	153.683	131.765
Minimum Score	40	60	40	44
Maximum Score	88	92	80	80

Based on the data in Table 1. it can be seen that the results of the calculations from the research data show that the pretest results of the experimental class PGSD students before the Quizizz media application was applied got an average score of 66.59 with a minimum score of 40 and a maximum score of 88. At the same time, the post-test results of students in The control class PGSD after the Quizizz media application was applied got an average score of 73.18 with a minimum score of 60 and a maximum score of 92. Then the pretest results of the control class PGSD students before the Kahoot media application was applied got an average score of 56.12 with a minimum score of 40 and the maximum score of 88. At the same time, the post-test results of the control class PGSD students after the Kahoot media application was applied got an average score of 58.59 with a minimum score of 44 and a maximum score of 80. So from this data, the Quizizz application media application influences the ability of Higher order thinking skills (HOTS), which is proven n with the post-test results of the experimental class PGSD students having a greater average of 73.18. Furthermore, the prerequisite testing, the normality and homogeneity tests, must be carried out before testing the hypothesis. The normality test and homogeneity test can be seen in table 2.

Table 2. Normality Test Results

Statistic	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
experimental class pretest results	IPA-A2	0.110	34	0.200	0.963	34	0.302
control class pretest results	IPA-A1	0.130	34	0.157	0.931	34	0.034
experimental class posttest results	IPA-A2	0.111	34	0.200	0.949	34	0.114
control class post-test results	IPA-A1	0.158	34	0.031	0.921	34	0.017

The normality test is a way to determine the results of the HOTS ability in science learning for PGSD students by using the Quizizz media application whether it has normally distributed data or vice versa. Calculations were performed through a normality test with a significant level (α = 0.05). So it is known from Table 2 that the results of the normality test can be analyzed by comparing the largest (sig.) score with a significant level (α = 0.05). If the score (sig.) > (α = 0.05) is data that is normally distributed. Based on Table 3, it can be found the score (sig.) of the experimental class and the score (sig.) of the control class which have a score higher than 0.05. The results of the two classes show that the data is normally distributed. The analysis was continued on the homogeneity test with a significance level of = 0.05. If the score (sig.) is superior to the significant level (α = 0.05), then the data is homogeneous. On the other hand, if the result is (sig.) < 0.05, then the data is not homogeneous. The results of the homogeneity test are presented in Table 3.

Tabel 3. Homogeneity of Variance Test Results

	Box's M	**4.351**
F	Approx.	1.432
	df1	3
	df2	31363.200
	Sig.	0.231

Table 3 shows that the calculation results in both classes have a score (sig.) 0.231 > 0.05, so it is homogeneous data after calculating the normality test and homogeneity test with the results of the calculation of the results of normal and homogeneous data. In the next step, the researcher conducted a hypothesis test, the t-test, presented in Table 4.

Table 4. T-Test Results

Statistic		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Result HOTS - Class	61.118	13.665	1.172	58.800	63.435	52.157	135	0.000

Based on the calculation of the paired sample t-test with SPSS version 23, there are requirements when making decisions. If the score of sig. (2-tailed) is smaller than the score of (0.05), then H0 and H1 are accepted. The paired sample t-test test tests the hypothesis of an increase in the pretest and post-test scores for the class given the Quizizz treatment and the non-treatment class. The results show that Table 5 has a smaller significance score of 0.05, which is 0.000 <0.05. So it can be concluded that using the Quizizz media application affects the ability of Higher order thinking skills (HOTS) of second-semester PGSD students in science subjects. Thus, based on the analysis of the hypothesis, there is a significant difference in the ability of Higher order thinking skills (HOTS) jointly between experimental class students (IPA A2) during the learning process using the Quizizz media application and control class students (IPA A1) during the learning process and using Kahoot media application. This can also be proven by the ANOVA results in the table below. The data results show a significance score of 0.000 <0.05 or less than 0.05. So it can be proven that quizizz media application affects the ability of Higher order thinking skills (HOTS). The results of the one-way ANOVA test are presented in Table 5.

Table 5. One Way ANOVA Result

Statistic	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6179.176	3	2059.725	15.567	0.000
Within Groups	17464.941	132	132.310		
Total	23644.118	135			

Discussion

The research analysis results show that using the Quizizz media application affects students' Higher order thinking skill (HOTS) ability in science learning. It means that the Quizizz media application is better and more effective because the Quizizz application media allows students to be involved in lessons and complete their assignments so that the learning process becomes more permanent and efficient (Degirmenci, 2021; Nurdin & Anhusadar, 2020). A permanent and efficient learning process in using the Quizizz application can be realized because this Quizizz media application has many features that help students in the learning process, such as features in delivering material through videos, pictures, and various forms of quizzes (Jati, 2020; Ningsih et al., 2021; Nizaruddin et al., 2021; Yana et al., 2020). To encourage student motivation in learning and improve higher-order thinking skills (HOTS). They recall the importance of students' higher-order thinking skills (HOTS). Higher-order thinking skills (HOTS) are very interesting to show that students must experience learning that helps them improve their knowledge and thinking skills (Kwangmuang et al., 2021). In addition, through the HOTS thinking process, students will be able to increase their self-awareness of their thinking processes and their ability to criticize and solve problems (Jarvis & Baloyi, 2020).

Higher-order thinking skills (HOTS) are thinking skills that students must master to meet the demands of learning 4.0 (Astini, 2020; Chotimah & Nurdiansyah, 2017). High Order Thinking Skills (HOTS) is the ability to think systematically, which leads to applying knowledge, skills, and values in reasoning, reflection, problem-solving, decision making, innovating, and creating new things (Sismawarni et al., 2020; Syahri & Ahyana, 2021). In the process of high-level thinking, students are not only required to apply what they have learned but also to analyze, evaluate, and synthesize the knowledge they have acquired to solve problems in everyday life (Gradini et al., 2018; Sani et al., 2020; Saraswati & Agustika, 2020). The main purpose of Higher order thinking skills (HOTS) is for students to collect information, categorize it and generate new ideas to be implemented in other situations they have (Thamrin et al., 2019).

The results obtained in this study are in line with previous studies, which also revealed that the use of educational game-based learning media Quizizz was effective in improving student learning outcomes in the tenth-grade Office Technology subject (Citra & Rosy, 2020). Other studies also revealed that, in general, students considered using Quizizz to take quizzes assigned before face-to-face lectures in class, positively impacting learning activities in accounting courses. Students considered Quizizz an easy-to-use application. Its use made lectures fun, increased mastery of the material, and increased student motivation and activity in studying consolidated accounting courses (Amri & Shobri, 2020). Subsequent research also revealed the same thing, that it was stated that the quiziz educational game media could increase student activity in online learning during the prevention of the spread of Covid-19 social studies subjects (Nurhayati, 2020). Based on several previous research results, it can be said that the use of quiziz learning application media is very effective in using the online learning process.

4. CONCLUSION

Based on the results of the analysis of the results of hypothesis testing and the discussion that has been carried out, the conclusion in this study is that there are significant differences in the ability of Higher order thinking skills (HOTS) between experimental class students during the learning process using the Quizizz media application and control class students during the learning process using the Quizizz media application. The average score of the post-test results using the Quizizz media is higher than the post-test scores using the Kahoot media application. Thus, it can be concluded that Quizizz media application affects the Higher order thinking skills (HOTS) of UPY PGSD students in science learning.

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The Intensity of Visiting the School Library as an Indicator of Students' Reading Interest in Elementary Schools

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ABSTRAK

Permasalahan yang terjadi selama ini sekolah belum memanfaatkan perpustakaan sebagai sarana utama dalam proses pendidikan di sekolah. Guru belum mendorong peserta didik untuk intens mengunjungi perpustakaan dan rendahnya minat baca peserta didik. Penelitian ini bertujuan untuk menganalisis intensitas kunjungan dan tujuan peserta didik mengunjungi perpustakaan sekolah serta menganalisis pelayanan petugas perpustakaan sekolah kepada peserta didik di sekolah dasar. Jenis penelitian ini merupakan penelitian deskriptif dengan pendekatan kualitatif. Metode pengumpulan data melalui wawancara, observasi dan dokumentasi dengan instrumen berupa pedoman wawancara dan pedoman observasi. Analisis data dilakukan dengan data reduction, data display, dan conclusion drawing. Hasil penelitian menunjukkan bahwa intensitas kunjungan peserta didik mengunjungi perpustakaan sekolah yakni 2 s.d 4 kali dalam seminggu, hal ini tergolong rutin dan cukup baik. Tujuan peserta didik mengunjungi perpustakaan sekolah diketahui bukan hanya untuk membaca buku tapi juga berdiskusi dan menghabiskan waktu beristirahat. Pelayanan perpustakaan yang diberikan oleh petugas didapatkan hasil bahwa petugas memberikan informasi mengenai cara peminjaman buku, menegaskan kembali tata tertib saat di perpustakaan selain itu juga petugas memberikan pelayanan sesuai dengan jam pelayanan. Petugas selalu menjawab pertanyaan siswa serta juga cepat dan tepat dalam memberikan pelayanan.

ABSTRACT

The problems that have occurred so far are that schools have not utilized the library as the main means of the education process at school. The teacher has not encouraged students to visit the library intensely, and the students' reading interest is low. This study aims to analyze the intensity of visits, the purpose of students visiting the school library, and the services of the school librarian to students in elementary schools. This type of research is descriptive research with a qualitative approach. The method of collecting data is through interviews, observations, and documentation with instruments in the form of interview guidelines and observation guidelines. Data analysis was done by data reduction, display, and conclusion drawing. The results showed that the intensity of student visits to the school library was 2 to 4 times a week. It was routine and quite good. The purpose of students visiting the school library is known not only to read books but also to discuss and spend time resting. The library services provided by the officers showed that the officers provided information on how to borrow books and reaffirmed the rules while at the library. Besides that, the officers provided services according to service hours. Officers always answer student questions and are fast and precise in providing services.

1. INTRODUCTION

Reading is a process of building an understanding of written discourse to understand what is presented in an article (Aprinawati, 2018). Reading is a complex activity because someone needs a systematic way of thinking to understand the contents of the reading well (Agustin & Cahyono, 2017). Through reading activities, a person will collect word for word, then relate and interpret the contents of the reading and conclude with their reasoning (Ramadani, 2020; Riyanti et al., 2019). The level of ability and interest in reading a group of people will be able to determine and support the progress of a nation (Adryawin et al., 2018; Marimbun, 2019). A nation's quality parameter is seen from the condition of its education, so the educational process cannot be separated from the importance of reading. The knowledge of references, such as books, can only be obtained from reading (Fikriyah et al., 2020; Yoni, 2020). Someone who has a high reading interest will have a broader insight. Effective readers use a variety of reading strategies that are appropriate to the text and context to construct meaning when reading (Irhandayaningsih, 2019).

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However, the reality on the ground shows that the reading interest of the Indonesian people is low. It is evidenced by the results of observations and interviews at an elementary school in Koto Gasib, Siak Regency. The observations and interviews show that the intensity of student visits to the library tends to be low. During recess, students play more and rarely visit the library to read. The low reading interest of Indonesian students is also evidenced by a study by PISA on randomly selected 15-year-olds. Indonesia occupies 62 of 70 countries in the general category, namely Performance in Science, Reading, and Mathematics (Rohim & Rahmawati, 2020). Meanwhile, in the Reading category alone, Indonesia is ranked 44th out of 70 countries (Saadati & Sadli, 2019). After a year, interest in reading in Indonesia has not increased. It is shown by a study conducted by CCSU that Indonesia is in a worse position, ranked 60th out of 61 countries (Yoni, 2020). In fact, in terms of infrastructure assessment to support reading, Indonesia's ranking is above European countries (Hapsari et al., 2019).

The community and the government have made various efforts to increase students' interest in reading, including developing literacy programs and increasing the library's availability of facilities and infrastructure. Literacy is an ability related to reading activities. The literacy program is implemented by requiring each student to read for 5 minutes before class starts (Kartini & Yuhana, 2019; Ramandanu, 2019). Another effort to increase students' reading interest is by improving the existing facilities and infrastructure in the school library (Saadati & Sadli, 2019). A library is a place in which there are activities for collecting, processing, and disseminating (services) all kinds of information, both printed and recorded in various media such as books, magazines, newspapers, films, cassettes, tape recorders, videos, computers, etc. (Fitriani, 2017; Kastro, 2020). The school library is a library that exists in schools to serve students in meeting their information needs (Antoro et al., 2021). As an institution, no matter how small a school library is, it must have an organization by looking at the complexity of library problems in dealing with the world of education. Nowadays, libraries cannot be handled alone (Oktaviani & Liyah Agustinah, 2021). The library is one of the most important learning resources in the learning process.

Several studies have been conducted previously and revealed that improving the facilities and infrastructure in the library can significantly increase student visits to the library (Pahrurrazi et al., 2018). Other studies also reveal the same thing, namely that it is stated that library facilities and facilities, library collections service systems and procedures, and the attitudes and behavior of officers significantly affect the intensity of student visits (Huradju et al., 2020). Subsequent research revealed that increased student visits to the library impacted student learning outcomes (Nabilah et al., 2021). Based on the results of previous research, it can be said that the improvement of infrastructure and service quality in the library can increase the intensity of student visits to the library, which then affects the improvement of student learning outcomes in class. In previous studies, there has been no study on the intensity of visiting the school library as an indicator of elementary school students' reading interest. So this research focuses on this study to analyze students' intensity, visits, services, and goals to the library.

2. METHOD

This type of research is descriptive with a qualitative approach. This qualitative research is research that understands the phenomena experienced by research subjects, such as behavior, perception, motivation, and action, holistically and descriptively in the form of natural words (Moleong, 2017). This qualitative research emphasizes quality rather than quantity, and the data collected is not derived from questionnaires but comes from interviews, direct observation, and official documentation to obtain a clear and detailed picture of how the intensity of visits to the school library as an indicator of students' reading interest in one of the elementary schools in Koto Gasib, Siak Regency. The research procedure is presented in Figure 1.

The subjects involved in this study were elementary school students and library staff at the elementary school in Koto Gasib, Siak Regency. Data collection in the study was carried out using observation and interview methods, with research instruments in the form of observation and interview guide instruments. The grid of research instruments is presented in Table 1.

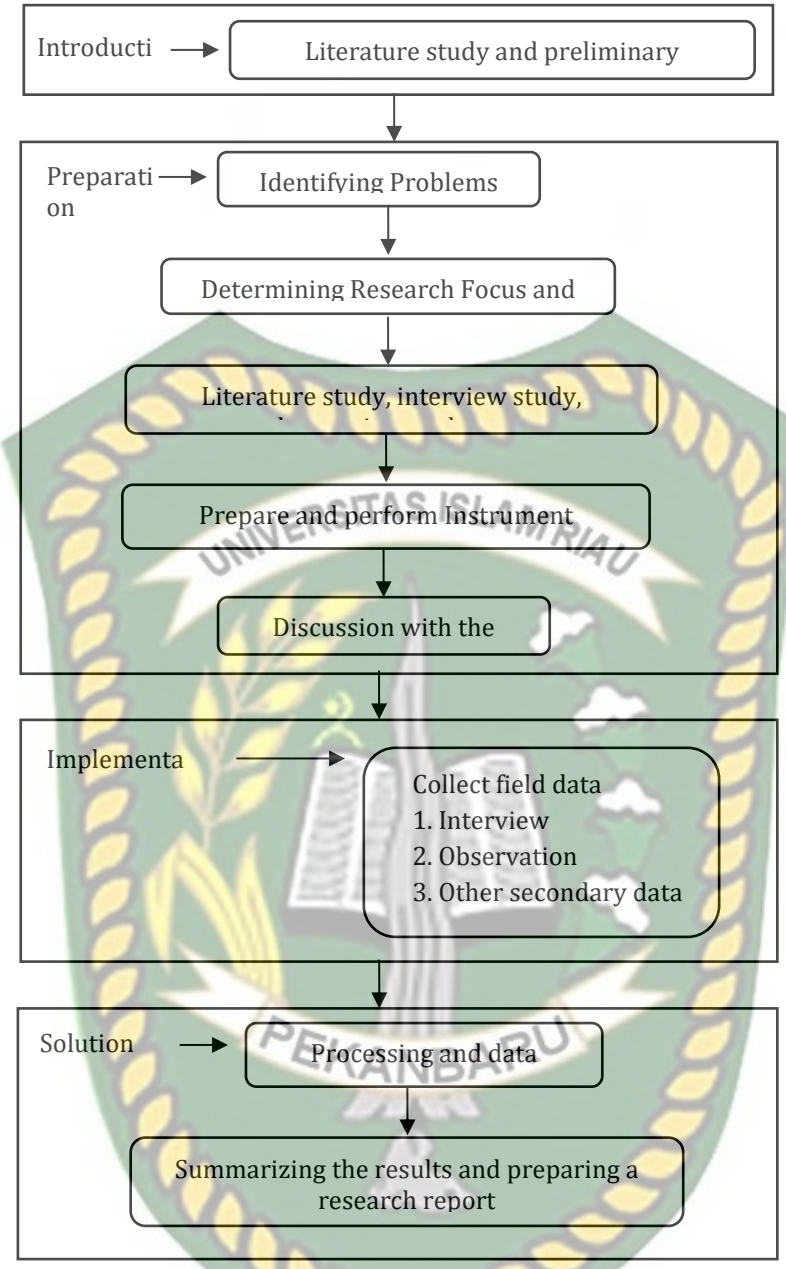

Figure 1. Research Flowchart

Table 1. Observation and Interview Instruments

No	Indicator	Sub Indicator
1	Student attendance at the school library	> 4x Very Often, 2-4x Often, 1-2x Rarely.
2	in 1 week.	Seek understanding and learn new things.
3	High curiosity over facts,	The type of book is complete and adequate.
4	theories, principles, knowledge, and information.	Clean library room.
5	Adequate physical environment	We are creating a good, polite, and friendly environment.
6	in the sense of the availability of reading materials that	Enthusiastic in finding the latest things.
7	attractive, quality, and diverse.	Motivate yourself.
8	A conducive social environment.	Use books or other sources as a reference for assignments.
9	Thirst for information, curiosity	Gain additional knowledge, knowledge, and new insights from what has been read.

No	Indicator	Sub Indicator
10	especially the latest.	When it comes to the library, the heart becomes happy.
11	The principle of life that reading is a	Often/rarely read in the library.
12	spiritual need.	Read the newspaper in the library.
13	Collect library materials	The officer confirms the rules of the library.
14	Increase knowledge	Officers provide information on how to borrow books.

The interview and observation instruments were validated with the supervisor and used a technique for checking the validity of the data, namely triangulation. The triangulation technique used in this research is source triangulation, namely by examining the data that has been obtained through several sources. Then from these several sources, the data are described and categorized based on their views, whether they are the same or not. The data analysis technique that the researcher uses is data reduction in summarizing, selecting, and focusing on the main things related to the study of the intensity of visits to the school library as an indicator of students' reading interest by taking detailed and thorough notes. Second, the presentation of data in the form of a re-description of data that has been reduced in the form of a narrative text regarding the study of the intensity of visits to the school library as an indicator of students' reading interest. And the last is concluding the data regarding the study of the intensity of visits to the school library as an indicator of students' reading interest.

3. RESULT AND DISCUSSION

Result

Four main findings in the study regarding the intensity of visiting the school library as an indicator of elementary school students' reading interest. The first finding relates to the intensity of student visits to the library, which shows that students often visit the library. Their intensity of visiting the library is 2-4 times a week. It is included in the frequent category. The intensity of the visit can be measured through the attendance list of student visitors. Every time students visit the library. They are required to fill out an attendance list. This list of visits can be measured from the tables and graphs of visits available in the library. The results of interviews with librarians and students at one of the elementary schools in Koto Gasib, Siak Regency, showed that students did not always use the library to seek information, facts, theories, or knowledge. Facilities and infrastructure are also very important things to pay attention to. Based on interviews conducted with informants, it was found that the types of books provided were quite complete, and the library room was also clean and comfortable. School libraries can instill self-study habits that ultimately enable students to learn independently.

The second finding relates to the situation and condition of the library. The results of observations and interviews show that the condition of the library is quite conducive. It follows the answers of officers and students at the time of the interview. In addition, the results showed that the library could motivate students to read through the books provided. The purpose of the library to provide services to readers is so that library materials that have been collected and processed as well as possible can reach the hands of readers. The library materials collected are primarily intended to be used by readers. Meanwhile, the processing facilitates the search for library material as desired by the reader.

The third finding shows that students feel happy when they come to the library because, in the library, there are many books or other sources provided. And the results also state that visiting the library will foster reading habits. To follow the development of a current event, students come to the library because there are also newspapers available. Libraries are not new in the community. Libraries have been organized everywhere, such as in public schools, vocational schools, and elementary and middle schools. The fourth finding relates to the service process for library employees, which shows that officers provide information on how to borrow books and reaffirm the rules when in the library. Besides, those officers provide services according to service hours. In addition, it was also obtained that the officers always answered students' questions and were fast and precise in providing services. Based on interviews conducted with informants, the results showed that the officers were friendly and polite. Officers are also fair to all students or library visitors.

Discussion

Based on the research analysis results, it was found that the intensity of student visits to the library increased after the improvement of facilities and infrastructure. Students in the library not only read books but also conduct group discussions and discuss the material given to the teacher. It certainly has a good

impact on increasing student interest in reading. Library facilities are one of the facilities provided by schools that aim to increase students' reading interest (Huradju et al., 2020; Nabilah et al., 2021; Pahrurrazi et al., 2018). The presence of students in visiting the library is certainly a desire for every library manager in every school. The intensity of student visits to the library can be grouped into several categories: Very often: 4x student attendance in the school library in 1 week. Often: 2-4x student attendance in the school library in 1 week. Rarely: 1-2x student attendance in the school library in 1 week (Afifah et al., 2020; Ariyani & Wirawan, 2017). It confirms that this library has a very important role in helping the community because it provides many Libraries that are usually used to find the latest information, both in terms of news, events, or just getting curious (Setiyawati, 2021). This place is usually also used for student learning, doing assignments, or looking for learning theories that might be used as study material (Wulandari et al., 2019). The function of this library is educative, which means that this school library provides books, both physical and non-physical (Adryawin et al., 2018). This availability can help students to get to know independent learning without any guidance from the teacher.

The facilities and infrastructure available in the library are very important things to pay attention to. Based on interviews conducted with informants, it was found that the types of books provided were quite complete, and the library room was also clean and comfortable. The benefits of school libraries, both in elementary and middle schools, are that they can create a love of students for reading (Fadhli et al., 2020; Huda, 2020). School libraries can enrich the learning experience of students and can instill independent study habits that ultimately enable students to learn independently. As a learning resource, libraries provide a place to study and read library materials, which can deepen the ownership and appreciation of the knowledge that the teacher has conveyed and as a resource (Ramadhanti et al., 2021). The main purpose of library procurement is to provide services to readers so that library materials that have been collected and processed as well as possible can reach the hands of readers (Mansyur, 2021). The library materials collected are primarily intended to be used by readers. Meanwhile, the processing facilitates the search for library material as desired by the reader. Library services can plan mandatory visits to the library, set a day of visiting the library, extend visiting hours to the library, and seek to borrow books (Hermawan et al., 2020; Lestari & Madeten, 2020; Syahdan et al., 2021).

The results obtained in this study are in line with the results of previous studies, which also revealed that an increase in facilities and infrastructure in the library could significantly increase student visits to the library (Pahrurrazi et al., 2018). Other studies also reveal the same thing, namely that it is stated that library facilities and facilities, library collections, service systems and procedures, and the attitudes and behavior of officers significantly affect the intensity of student visits (Huradju et al., 2020). Subsequent research revealed that increased student visits to the library impacted student learning outcomes (Nabilah et al., 2021). Based on the results of these studies, it can be said that the improvement of infrastructure and service quality in the library can increase the intensity of student visits to the library, which then affects the improvement of student learning outcomes in class.

4. CONCLUSION

Based on the data analysis and discussion results, it can be concluded that the intensity of student visits to the school library is 2 to 4 times a week. It is routine and quite good. The purpose of students visiting the school library is known not only to read books but also to discuss and spend time resting. The library services provided by the officers showed that the officers provided information on how to borrow books and reaffirmed the rules while at the library. Besides that, the officers provided services according to service hours. Officers always answer student questions and are fast and precise in providing services.

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The Impact of Brain Based Learning Strategy on Mathematical Communication Ability of Grade V Elementary School Students

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ABSTRAK

Sebagian besar siswa beranggapan matematika sebagai mata pelajaran yang rumit dan memberatkan, sehingga cenderung kurangnya minat mempelajari mata pelajaran matematika, kemampuan komunikasi matematis menjadi salah satu hal penting dalam pembelajaran. Oleh karena itu, agar pembelajaran matematika disukai, perlu dilakukan upaya untuk mengadopsi strategi pembelajaran yang dapat meningkatkan kemampuan komunikasi matematis siswa Sekolah Dasar. Penelitian ini bertujuan untuk mengetahui perbedaan strategi pembelajaran manakah yang menghasilkan kemampuan komunikasi matematis yang lebih tinggi antara Brain Based Learning dengan strategi pembelajaran konvensional. Penelitian ini merupakan jenis penelitian quasi experiment (eksperimen semu). Pengambilan sampel dengan teknik cluster random sampling. Teknik analisis data menggunakan uji normalitas, homogenitas, pengujian hipotesis dan hipotesis statistik. Kesimpulan dari penelitian ini adalah sebagai berikut: 1). Peningkatan nilai rata-rata sebesar 58,15 dialami kelas eksperimen dengan strategi Brain Based Learning lebih tinggi jika dibandingkan nilai rata-rata kelas kontrol sebesar 14,9. Sehingga kemampuan komunikasi matematis siswa di kelas eksperimen pada pelajaran matematika mengalami peningkatan yang signifikan dibanding kelas kontrol; 2). Hasil perhitungan statistik diperolehan t hitung yaitu 8,25 dan nilai t tabel didapatkan angka 1,99 lebih kecil dari nilai t hitung, sehingga strategi Brain Based Learning membawa dampak positif terhadap kemampuan komunikasi matematis kelas V dalam pembelajaran matematika.

ABSTRACT

Most students think of mathematics as a complicated and burdensome subject, so there tends to be a lack of interest in studying mathematics. Mathematical communication skills become one of the important things in learning. Therefore, so that math learning like, need made an effort to adopt learning strategies that can improve. Mathematical communication skills of elementary school students. This study aims to determine the differences in which learning strategies result in higher mathematical communication skills between students and students Brain Based Learning with conventional learning strategies. This research is a type of quasi-experimental research (quasi-experimental). Sampling with cluster random sampling technique. The data analysis technique used normality, homogeneity, hypothesis testing and statistical hypotheses. The conclusions of this study are as follows: 1). An increase in the average value of 58.15 experienced by the experimental class with Brain Based Learning strategy higher than the average value of the control class of 14.9. So that the mathematical communication skills of students in the experimental class in mathematics experienced a significant increase compared to the control group; 2). The results of statistical calculations obtained t count is 8.25 and the value of t table is 1.99 which is smaller than the value of t count, so Brain Based Learning strategy has a positive impact on the mathematical communication skills of class V in mathematics learning.

1. INTRODUCTION

Mathematics own very important role in human life, therefore Mathematics subject is always us see you a teach unit teaching. Thing this in accordance with the what which put forward in the Minister of Education and Culture, namely the subject of mathematics should give to all student starting from level school base on wards, to equip student with the ability to think logically, analytically, systematically, critically, innovative, and creative, as work ability same (Nenden., 2020; Setiani, 2018). Therefore, so that math learning process required and like, need made an effort to adopt the right learning strategy. The application of appropriate learning strategies can ideally strength then interest and motivation in the

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learning process so that teaching and learning activities can take place by optimally in accordance with educational goals (Adiansha & Sumantri, 2017; Mukhlis, 2016).

Likewise, with the goal Mathematics from the National Council of Teachers of Mathematics (NCTM) argues that the standard of mathematical competence required by students is problem solving skills, communication skills, connection skills, reasoning skills, and performance skills (Muslimahayati, 2019; NCTM., 2000). Skills Mathematical communication is an important skill that must be possessed by students. The development of communication skills can be done through various teaching units. Education units can be divided into three levels of education, namely basic education, junior secondary education, and higher education (Lestari et al., 2021). Mathematical communication skills become one of the important things in learning, especially when it comes to prerequisite material. Mathematical communication skills are needed so that students can recognize and use connections between interrelated mathematical ideas and create other ideas, as well as recognize and apply mathematics in contexts other than mathematics (Lestari et al., 2021; Oktaviani et al., 2019). However, the reality in the field of mathematical communication for elementary school students in learning mathematics is still very low.

The results of the fifth-grade mathematics assessment at SDN Pangadegan 07 Pagi, South Jakarta, are still relatively low. The problems raised explain that some students do not understand or have difficulty understanding the material taught in mathematics. One of the factors behind this problem is that students lack enthusiasm for learning, students tend to be less actively involved in learning activities and experience a decrease in mathematical communication skills. This can be seen from the average value of one semester is 70, as many as 30 students. 10 students who are able to achieve a value above the KKM and the rest of the students have not been able to get the value that has been set on the KKM. Skills mathematical communication will show understanding to concepts learned (Adiansha & Sumantri, 2017; Nilawati. et al., 2019). When something mathematical information concept is given to a student by a teacher, or when a student do it yourself through read, occur transition informal mathematics from the communicator to the communicator (Amalia & Saumi, 2018; Deswita & Kusumah, 2018). One of characteristic math is full with the term and symbol, so that the ability to communicate in mathematics is a condition special. Mathematical communication competence is ability disclose situations, pictures, diagrams in language, symbols, and ideas (Maulani et al., 2017; Saparudin & Effendi, 2019; Solihah et al., 2018).

At the international level, currently there are two main assessments that assess students' math and science abilities, namely TIMSS (Trend in International Mathematics and Science Study) and PISA (Program for International Student Assessment). PISA is a literacy competency for international study elementary school students that aims to measure students' reading, math, and science literacy achievement (Hadi & Novaliyosi., 2019; Musfiroh & Listyorini, 2016). This study was coordinated by the OECD (Organization for Economic Cooperation and Development) based in Paris, France. Indonesia is ranked 73 out of 79 participants with an average math score of 379. 5. Ability communicate directly mathematics is one field Cognitive that ideally must have student. Mathematical communication is Skills must-have students, as stated in Skill score curriculum 2013 (Muslimahayati, 2019; Wijayanto et al., 2018). These core competencies include: 1) Appreciate and practice the teachings of the religion he adheres to; 2) Be honest, disciplined, responsible, caring (mutual cooperation, cooperation, tolerance, peace, courtesy, responsive and proactive and interact effectively with the social and natural environment as well as world relations; 3) Understand, apply, analyze factual knowledge, conceptual, procedural based on his curiosity about science (Muslimahayati, 2019; Putrawan & Suharta, 2014).

Thus, realizing the importance of mathematical communication skills, as well as to create a pleasant mathematics learning atmosphere, teachers should pay attention to one important thing in the human body whose abilities are still not optimized, namely the ability of the brain (Setyoningrum. et al., 2020; Wigati., 2017). Therefore, it is necessary to have a learning strategy that optimizes the brain's thinking process and can improve mathematical communication skills in students' mathematics learning. So a suitable learning strategy to improve mathematical communication skills as expressed by Jensen is the Brain Based Learning strategy. Brain Based Learning is learning that is aligned with the way the brain is naturally designed to learn (Fauzia., 2021; Saputra et al., 2019). Brain Based Learning offers a concept to create learning oriented towards empowering the potential of students' brains (Deswita & Kusumah, 2018; Wigati., 2017). This allows a biological work system in the body to work to influence the structure and function of the brain in order to learn naturally. Basically, Brain Based Learning functions real experience in the learning process (Fauzia., 2021; Oktaviani et al., 2019; Saputra et al., 2019).

The planning stages of the Brain Based Learning strategy that Jensen revealed in his book are pre-exposure, preparation, initiation and acquisition, elaboration, incubation and memory entry, verification and belief checking, and the last stage is celebration and integration (Jensen, 2011; Solihat et al., 2017). Meanwhile, according to Sapa'at, there are three main strategies that can be developed in the implementation of BBL (Brain Based Learning), namely: 1) Creating a learning environment that challenges

thinking skills; 2) Creating a fun learning environment; 3) Creating an active and meaningful learning situation for students (Purnama, 2016). Thus, learning mathematics through Brain Based Learning strategies provides opportunities for students to hone mathematical communication skills. In addition, a challenging and fun learning environment will also motivate students to actively participate and have optimal activities in learning, because the growth of motivation can move students to learn or master the material being studied (Jensen, 2011; Purnama, 2016). Based on these problems, this study aims to determine the differences in mathematical communication skills between students who use Brain Based Learning strategies with conventional learning strategies.

2. METHOD

This research is a quasi-experimental type of research (quasi-experimental) with a pre-test and post-test control group design. In simple terms, the research design used can be described as in Table 1.

Table 1. Research Design Pre-test and Post-test Control Group Design

Pre-Test	Treatment Group	Post-Test
O_1	X_1	O_2
O_3	X_2	O_4

Information:
O_1 : experimental class pretest
O_2 : final test (post-test) experimental class
O_3 : control class pre-test
O_4 : final test (post-test) for control class
X_1 : treatment (Brain Based Learning strategy
X_2 : control class (multi-strategy)

The population in this study were all fifth-grade elementary school students in Pangadegan Village, South Jakarta with a total of 173 students. Then the sampling was carried out using cluster random sampling technique, so the sample in this study was 64 students consisting of students in class VA and VB at SDN Pangadegan 07 Pagi, South Jakarta. The instrument developed in this research is a test of mathematical communication skills equipped with an assessment rubric that is useful in scoring. While the data analysis technique used normality test, homogeneity, hypothesis testing and statistical hypothesis. The data from the students' mathematical communication ability test results are ordinal data, so first the data is converted in the form of interval data using MSI (Method Successive Interval) either manually or with the help of Microsoft Excel 2010. The data processed in this study is the result of pre-test data. and the results of post-test data obtained from the experimental class and the control class. Furthermore, the data was tested using the t-test at a significant level α =0,05.

3. RESULT AND DISCUSSION

Result

The results of the study were carried out at SDN Pangadegan 07 Pagi, South Jakarta by giving treatment to the two classes, namely class VA as the experimental class with a total of 32 students and class VB as a control class with a total of 32 students. Both classes will be given a pre-test and post-test. Based on the summary of the pre-test scores, it can be explained that of the 32 students there was the lowest score of 13 and the highest score of 98. In addition, descriptive statistical calculations showed the average gain of the experimental class was 44.25, the median was 44.5, the mode was 13, and standard deviation 23.12. So that the acquisition of the smallest and largest range of values in the experimental class is 85 and the length of the class is 15. There are 16 students (50%) of the 32 students in the experimental class who have scores below the average, while the group of students who have scores around the average and above the average are 16 students (50%).

Obtaining pre-test scores before getting treatment with Brain Based Learning strategy. Furthermore, the acquisition of pre-test score data was analysed to see an initial picture of the mathematical communication skills of control class students. Based on the summary of the pre-test scores, it can be explained that from 32 students the lowest score was 13 and the highest score was 110. In addition, descriptive statistical calculations showed the control class average gain was 54.2, median 56, mode 57, and deviation default 25.9. So that the acquisition of the smallest and largest value ranges in the control class is

97 and the class length is 17. There were 15 students or about 46.9% of the 32 students in the control class who had scores below the average, while 53.1% or 17 students scored around average or above the average. Obtaining pre-test scores before receiving treatment with conventional learning strategies.

Then the acquisition of post-test value data is obtained by calculating the results of the student worksheet assessment from working on the instrument in the form of description questions, after receiving treatment with the Brain Based Learning strategy. The post-test data were then analysed to see the final picture of the experimental class students' mathematical communication skills. Based on the summary of post-test acquisition data, it can be explained that from 32 students there is the highest score, namely 147. In addition, descriptive statistical calculations show the average gain of the experimental group is 102.4, median is 106.5, mode is 128, and standard deviation is 28.5. So that the acquisition of the smallest and largest range of values in the experimental class is 94 and the length of the class is 16. There are 18 students or about 56.25% of the 32 students in the experimental class having post-test results above the average. Obtaining post-test scores after receiving treatment with Brain Based Learning strategy.

The summary of the post-test acquisition data, explained that from 32 students the highest score was 121. In addition, descriptive statistical calculations showed the control class average gain was 69.1, median 76, mode 79, and standard deviation 27.6. So that the acquisition of the smallest and largest ranges of values in the control group is 105 and the class length is 18. The results of the data analysis show that 56.25% or 18 students got post-test results around average or above average. Obtaining post-test scores after receiving treatment with conventional learning strategies. The next stage is to test the normality of students' mathematical communication skills through the normality test of the Lilliefors test by making a comparison between Lcount and Ltable. The normality test gain is recognized as normal (accepted) if $L_{count} < L_{table}$, while the post-test gain is recognized as abnormal (rejected) if $L_{count} > L_{table}$. Table 2 presents the results of the normality test from the posttest results for the experimental class and the control class.

Table 2. Normality Test of Students' Mathematical Communication Ability

No.	Class	L_{Count}	L_{table}	Conclusion
1.	Experiment	0.109	0.157	Normal
2.	Control	0.089	0.157	Normal

The results of the normality test in the experimental class obtained the results of the calculation of the Lcount value of 0.109. Meanwhile, the calculation result for the L_{count} for the control class is 0.089. The value of L_{table} for both classes is equal to 0.157 because it has the same number of samples, namely 32 students with a significant level of 0.05. Through the results of the calculations, the experimental class and the control class both got a smaller L calculated value than the table L value, so that the data from the two sample groups could be declared normally distributed. Furthermore, the acquisition of research data was also analysed by homogeneity test through the use of the Bartlett test. Table 3 presents the results of the homogeneity test through the Bartlett test.

Table 3. Homogeneity Test of Students' Mathematical Communication Ability

Class	Variant Source	X^2_{count}	X^2_{table}	Conclusion
Experiment	*Post-test*	0,029	3,841	Homogeneous
Control	*Post-test*			

Obtaining the Bartlett test for students' mathematical communication skills, the results of the calculation of the calculated X^2 value are 0.029. In addition, the value of X^2 table is 3.841 because dk is 1 and the significance level is 0.05. Thus, the conclusion is that X_{count} is smaller than X_{table}, so that the experimental class and control class in this study are recognized as homogeneous. The last is hypothesis testing. The purpose of testing the hypothesis in this study is to prove the rejection or acceptance of the formulated null hypothesis. According to the results of the normality and homogeneity tests, it was recognized that the data from the experimental class and control class were normally distributed and homogeneous. Next, the researcher tested the hypothesis through a t-test. Table 4 presents the results of the t-test calculation.

Table 4. Hypothesis Test

df	α	t_{count}	t_{table}	Conclusion
62	0.05	8.25	1.99	H_0 rejected H_1 accepted

The t-test obtained in this study, namely t_{count} = 8.25, for the t_{table} value because the significance level is α= 0.05 and dk = 62 so that the t_{table} is 1.99. Then the acquisition of t_{count} is greater than t_{table}, 8.25> 1.99 or in other words the null hypothesis statement can be rejected and the alternative hypothesis statement accepted. Therefore, with the acceptance of the alternative hypothesis, it is proven that there is a positive significant difference effect with the implementation of the Brain Based Learning strategy on the mathematical communication skills of fifth grade students at SDN Pangadegan 07 Pagi, South Jakarta.

Discussion

Brain Based Learning strategy enables real experience in the learning process. There are five components in the brain's natural learning system, namely: 1) The curious brain, arouses interest in new things. This is a component of the brain that tends to become more active when we are faced with new ideas and challenges. 2) The meaningful brain, meaning is more important than information. The brain seeks meaning through imitation. Imitation enables the brain to store knowledge in memory. 3) The emotional brain, emotions and intelligence come from different parts of the brain, but both work integrally and inseparable and can be enhanced using stimuli and challenges. 4) The social brain, our brain is social. Interaction and social conditions affect stress levels. The learning process will be more effective if it is carried out in a situation that is pleasing to the learner where the process of building a structure of understanding, cooperative learning, and social interaction is possible in it. 5) The conscious and subconscious brain, learning involves conscious and subconscious processes. Learning does not only occur in the classroom, but also in everyday life (Solihah et al., 2018; Ulfa., 2020).

The steps of the Brain Based Learning model according to Jensen are as follows: 1) Pre-Exposure. This stage gives the brain a review of the new learning before really delving into it. 2) Preparation. The stage of creating curiosity. 3) Initiation and Acquisition. The stage of entering learning materials. Provide group projects that facilitate students to build knowledge and understanding of a subject matter based on their own learning experiences. 4) Elaboration. The processing stage requires pure thinking skills from students. One group presents the results of their group work and another group responds to the presentation so that class discussion occurs. 5) Incubation and Memory Entry. This stage emphasizes the importance of rest and repetition time. Do some stretching and relaxation. 6) Verification and Confidence Checking. Both teachers and students need to confirm their learning. Quiz (Verbal and/or written). Write a journal about what you have learned. 7) Celebration. This stage involves emotions, make this stage exciting, cheerful and fun. Close the lesson with a celebration or appreciation (Fauzia., 2021; Kusuma et al., 2020; Purnama, 2016).

Data collection in this study was carried out by taking pre-test data on Monday, April 4, 2022, which was given to the experimental class and control class. The experimental class pre-test data got an average result of 44.25 while the control class got an average result of 54.2. Furthermore, the two classes were given mathematics learning with different treatments, the experimental class with Brain Based Learning strategy and the control group with conventional learning strategies. Brain Based Learning strategy is applied to the experimental class. Learning is carried out in four meetings within a month or once a week which is scheduled every Friday. In the learning process Brain Based Learning strategy has 7 stages (Fauzia., 2021; Kusuma et al., 2020; Purnama, 2016) namely: first, Pre-exposure. This phase gives the brain a review of the new learning before really digging further: Pre-exposure helps the brain build a better conceptual map (Al-Balushi & Al-Balushi, 2018; Sari et al., 2019).

At this stage. the teacher greet and instruct students to pray before starting the lesson, the teacher checks the attendance of students as a discipline, the teacher conditions the class atmosphere to be ready to follow the learning process, such as instructing students to keep all books that are not related to the learning that will take place, and teachers Guiding students in class to do Brain Gym movements to help students concentrate during the learning process. Second, Preparation. At the preparation stage, the teacher gives an initial explanation of the material to be studied and relates the material to everyday life and students respond to what the teacher says, the teacher re-checks the students' understanding of the prerequisite material, the teacher motivates students by showing examples of material in the text. In everyday life, the teacher conveys the sub-materials to be studied in outline, the teacher conveys the learning objectives to be achieved, and the teacher conveys the approaches and learning models that will be used in the learning process. This phase is a phase in creating curiosity or pleasure (Al-Balushi & Al-Balushi, 2018; Jensen, 2011; Sari et al., 2019).

Third, initiation and acquisition. Students read books from various sources related to the sub-subject of drawing straight-line graphs, students are formed into several groups consisting of 4-5 people, each group is distributed LKPD, students are given directions that each group must do each activity on the LKPD by discussing together with their group friends, students are asked to observe the problems presented in each activity contained in the LKPD, then students are led to ask questions related to the things observed in the activities contained in the LKPD. This stage is the stage of creating connections or when the

neurons "communicate" with each other (Fauzia., 2021; Jensen, 2011; Sari et al., 2019). Fourth, Elaboration. Students in groups try to get ideas in solving problems given by the teacher, students discuss and collect the necessary information by reading books or various existing learning resources to solve the problems presented in the LKPD, students in groups are directed to analyze, reason and discuss problems in order to write down the solutions to the problems presented, students are asked to find other alternative solutions in solving problems on the LKPD, students are led to issue ideas, ideas or main thoughts in solving the problems presented, students are asked to re-examine the work that has been done, some groups are asked to present the results of their discussions in front of the class while other groups provide responses, from the results of the presentation students are expected to can see possible answers to the problems solved, students are directed to find the most unique solution, students are asked to make conclusions about the results of the presentation, and students are given feedback or reinforcement of the conclusions that have been made.

The elaboration stage provides an opportunity for the brain to sort, investigate, analyse, test and deepen learning. This is the processing stage, where it is time to make learning more meaningful (Fauzia., 2021; Jensen, 2011; Sari et al., 2019). Fifth, Incubate and insert memory. at this stage students stretch or relax while watching learning videos that support the material being studied, during the learning video playback, the teacher gives some simple questions related to the material that has just been studied. This phase emphasizes the importance of rest and time for repetition is an important thing (Al-Balushi & Al-Balushi, 2018; Jensen, 2011; Sari et al., 2019). Sixth, Verification and confidence checking. At this stage, the teacher checks whether the students have understood the material that has been studied by asking some questions to the students, the teacher checks whether the students have understood the material that has been studied or not. Students also need to know whether they have understood the material or not. Seventh, Celebration and integration. The teacher gives rewards to the group based on the success of the group learning, the teacher asks reflex questions, the teacher informs the material to be studied at the next meeting, in closing the teacher together with the students do small celebrations such as cheering and clapping together, the teacher ends the lesson by linking the material with religious and social values (Al-Balushi & Al-Balushi, 2018; Jensen, 2011; Sari et al., 2019).

While the implementation of conventional learning strategies carried out in the control class, teaching and learning activities are more directed to the teacher centre, so that when studying the researchers only provide verbal explanations. This situation resulted in students not actively seeking information independently and made students' mathematical communication skills less developed optimally. The mathematical communication ability of students in the experimental and control classes can be seen in the increase in the difference between the average scores of the pre-test and post-test results. The average pre-test result in the experimental class is 44.25 and the post-test is 102.4, while the average pre-test result in the control class is 54.2 and post-test is 69.1. The average gain of the experimental class by applying the Brain Based Learning strategy showed an increase of 58.15 points higher than the average gain of the control class with an increase of 14.9 points, so that the mathematical communication skills of students in the experimental class experienced a significant increase compared to that of the experimental class. control class.

Based on statistical calculations of the research data obtained through the t-test, the t-count gain is 8.25. Meanwhile, the value of t table with dk (number of samples minus two) is 62 and a significant level of 0.05 is 1.99 which is smaller than the t-count value, thus making the alternative hypothesis accepted and the null hypothesis rejected. The accepted alternative hypothesis statement states that there is a positive impact with the implementation of the Brain Based Learning strategy that is able to bring about an increase in the mathematical communication skills of fifth grade students at SDN Pangadegan 07 Pagi, South Jakarta. The difference in the average value of the post-test results of the two classes can also show that the Brain Based Learning strategy has a more positive impact and students' mathematical communication skills in the experimental class are better than the control class, because the average experimental class is 102, 4 while the average control class is 69.1. The development of students' mathematical communication skills can be caused by learning activities that support students in developing their thinking skills. Emphasis on activities that require students to relate the material to real problems in their daily activities.

4. CONCLUSION

The improvement in mathematical communication of fifth grade students at SDN Pangadegan 07 Pagi, South Jakarta, in the experimental class occurred significantly compared to the control class. The results of statistical calculations on research data obtained through t-test, the acquisition of t count is 8.25. Meanwhile, the value of t table with dk (number of samples minus two) is 62 and a significant level of 0.05 is 1.99 which is smaller than the t-count value, thus making the alternative hypothesis accepted. The

accepted alternative hypothesis, states that by applying Brain Based Learning strategy has a positive impact on the mathematical communication skills of class V SDN Pangadegan 07 Pagi South Jakarta in learning mathematics.

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The Succesful of Student Well-Being Development Through Child-Friendly School Programs

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ABSTRAK

Pergeseran paradigma dalam dunia pendidikan telah merangsang munculnya isu-isu baru tentang fokus pendidikan, termasuk tentang kesejahteraan siswa. Kesejahteraan siswa di sekolah akan berdampak besar bagi kesuksesan mereka secara akademik, sosial-emosional maupun perkembangan kesehatan mereka. Salah satu upaya meningkatkan kesejahteraan siswa di sekolah adalah program sekolah ramah anak. Penelitian ini bertujuan untuk menganalisis keberhasilan sekolah ramah anak dalam mengembangkan kesejahteraan siswa. Dengan menggunakan metode observasi dan wawancara pada kepala sekolah, wakil kepala sekolah, guru dan staf akademik di salah satu sekolah dasar. Data di analisis dengan menggunakan teknik analisis tema. Hasil penelitian ini menunjukkan bahwa model sekolah yang mampu mengembangkan kesejahteraan siswa adalah sekolah yang dalam proses penyelenggaraannya terdapat pola pembelajaran yang berpihak pada siswa, pola relasi sosial yang humanis diantara warga sekolah, serta dukungan lingkungan dan infrastruktur yang ramah terhadap siswa. Hasil penelitian ini berimplikasi bahwa kebijakan dalam praktik pendidikan harus mampu mendung pada penyelenggaraan sekolah ramah anak yang ternyata dapat menjadi solusi dalam mengembangkan kesejahteraan siswa.

ABSTRACT

The paradigm shift in education has stimulated the emergence of new issues regarding the focus of education, including student wellbeing. The well-being of students at school will have a significant impact on their academic success and socio-emotional and health development. One of the efforts to improve student welfare is the child-friendly school program. This study aims to analyze the success of child-friendly schools in developing student welfare by using the method of observation and interviews with principals, vice-principals, teachers, and academic staff in one of the elementary schools. The data were analyzed using theme analysis techniques. The results of this study indicate that a school model that can develop student welfare is a school that, in the process of its implementation, there is a learning pattern that favors students, a pattern of humanistic social relations among school residents, as well as environmental support and infrastructure that is friendly to students. This study implies that policies in educational practice must be able to cloud the implementation of child-friendly schools, which can be a solution to developing student wellbeing.

1. INTRODUCTION

Education, which has only paid attention to the cognitive and intellectual dimensions, has changed. Other dimensions such as psychological well-being are now an essential part of the attention for the success of education. Education as a means to develop interests and talents following students' potential is not always a fun learning space because it also creates psychological pressure and burden (Kalkan & Dağlı, 2021; Muchsini & Siswandari, 2020). The Indonesian Child Protection Commission reported as many as 1,463 children being expelled as victims of school policies. The data shows that schools have not been friendly to children. Students will learn comfortably and safely in a child-friendly school (Aziz et al., 2020; Thomas, 2018). There are three trends in studies on the development of student welfare, whether conducted in child-friendly schools or regular schools. First, a study that focuses on the development of student welfare is carried out by teachers in classroom learning practices (Äärelä et al., 2018; Virtanen, 2019). The second is a study on the development of student welfare through the creation of a conducive school climate (Hughes, 2019; Yang, 2018). Third, a study that focuses on the cooperation of schools and parents in educational practice (Bang, 2018; Lozančić et al., 2019) This article explains the three studies to develop student welfare in child-friendly schools.

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Recently, the World Health Organization (WHO) has promoted mental health, sometimes called well-being, as an integral part of educational processes because it is believed there is no successful education without well-being. At the international level, awareness of health or well-being promotion in schools has become a significant World Health Organization (WHO) program. According to this organization, the definition of health is healthy physically, mentally, socially, and emotionally, not just avoiding someone from the disease (Coll-Seck, 2019; Oladapo, 2018). There are three reasons why students' well-being becomes a vital education agenda in school in the education context. First, there are many social and emotional problems related to the student's social and emotional difficulties (Park, 2020; Salle, 2018). Second, the teacher has an essential role in making students socially and emotionally prosperous in school (Aziz et al., 2021; Mairitsch, 2021). Third, Academic achievement can be increased if the school can improve the student's social and emotional well-being in school (Poots, 2020; Rodríguez, 2020). These three reasons show how important the development of student welfare is in the practice of education in schools.

In policy and academic literature, mental well-being is often used interchangeably with positive mental health. Historically the understanding of what constitutes well-being has been a very long and lively debate, primarily focusing on two views: hedonic and eudemonic. Hedonic well-being is concerned mainly with the following states of pleasure and happiness and eudemonic with the actualization of human potential. The hedonic tradition embodies human concerns with maximizing the amount or duration of positive or pleasant feelings while minimizing the amount of time of harmful or unpleasant feelings. The eudemonic is the tradition of eudemonia that animates human concerns with developing nascent abilities and capacities toward becoming a more fully functioning person and citizen (Pulimeno, 2020; Strelhow et al., 2020). So far, research on student well-being in Indonesia has been mainly studied by applying the concept of child-friendly schools. Research examining child-friendly schools for elementary school students found that activities are implemented humanely. All students are treated without discrimination, involved teachers actively and innovatively, created a safe and comfortable learning environment, and included students actively and creatively in the learning process (Akmaliyah, 2021; Hajaroh, 2020). Some of the results of these studies indicate that child-friendly schools are a solution in efforts to develop student welfare in schools.

However, the research found that child-friendly schools in pilot schools were not appropriately implemented because they faced many obstacles such as physical violence perpetrated by teachers and students, lack of control from parents, a less conducive environment, which caused children to face legal problems (Fitriani, 2021; Syafrudie, 2021). Similar research found that the supporting factors for implementing child-friendly schools were the support from various parties and the school's commitment to implementing the program. In contrast, the inhibiting factor was limited financial resources to meet children's needs adequately, facilities, and infrastructure. Infrastructure that is not friendly to children with special needs and an unhealthy school environment endangers children's health (Schwab, 2020; Vinuela-Navarro, 2019). From some of the findings above, studies on student well-being with the application of the concept of child-friendly schools in Indonesia are inconsistent because they do not have a solid conceptual footing. School well-being conceptualizes as a four-dimensional phenomenon, namely school conditions (having), social relations (loving), self-fulfillment (being), and health status. School conditions (having) include the physical environment, the environment around the school, and the environment within the school. The working environment is safe, comfortable, ventilation and temperature. Social relations (loving) refer to the social learning environment, student-teacher relations, relations with schoolmates, group dynamics, bullying, cooperation between school and home, decision making in schools, and the atmosphere of the whole school organization. The means of self-fulfillment include each student's possibility to learn according to his resources and abilities. Every aspect of well-being contains several aspects of student life at school. Health means a student's physical health condition (Hou, 2021; Konu & Rimpella, 2002).

School climate and learning climate affect the well-being of students' presence and satisfaction in school. Relationships and atmosphere promote one's resources in society and increase school achievement (Doll, 2021; Flores-Verduzco, 2020). In the school well-being model, the relationship between school and home is social relations. Furthermore, the school's relationship with the Institute and the surrounding community is meaningful (relations with social affairs and the health care system). Student-teacher relationships have an important role in well-being in schools. Teacher affiliation is part of the school climate. It means teachers feel comfortable with each other, their work, and their students and are committed to students' well-being (Miller, 2019; Turner & Teilking, 2019).

This study aims to reveal the success of child-friendly schools in ensuring the well-being of students. In line with these objectives, three questions were formulated: What is the learning program in child-friendly schools; How is the design of social relationships built between school members; how are the environment and school facilities supporting the development of student well-being. The answers to these questions may serve as the basis for determining various policies to foster and build student well-being at

the basic education level through child-friendly schools. This study argues that schools that prioritize student welfare in Indonesia are identical to child-friendly schools. Three characteristics that characterize child-friendly schools are: First, schools whose learning patterns pay attention to the needs of students. Second is the pattern of humanist social relations among school members. Third, support for a child-friendly environment or infrastructure. These three arguments form the basis for writing articles on the development of student welfare through child-friendly school programs at the basic education level.

2. METHOD

Following the research objectives, the approach used in this research is qualitative research, a case study type. The qualitative type was chosen because the researcher aims to describe the process of child-friendly education in developing student well-being in schools. The research location is the elementary school in East Java, Indonesia. The educational process in these schools is by optimally developing all the potential intelligence of students. There are three kinds of data explored in this study: First, data on learning programs that favor students, using data on the implementation of having aspects in schools. Second, the design of humane social relations among school members, using data about the performance of the loving element in schools. Third, support a social environment and infrastructure, using data on implementing aspects of being in schools. The research was carried out in conditions of the COVID-19 pandemic so that researchers carried out the process of fulfilling the health protocol.

This study used five persons as informants: the principal, vice-principal, two teachers, and academic staff. Data related to school policies were obtained from the principal, while data related to the learning process in the classroom and outside the school was obtained from the vice-principal, teachers, and academic staff. The selection of the five informants was based on the assumption that they were the people who knew best about the process of child-friendly school education. Research data were collected through observation, interviews, and documentation. Observations were made to observe the condition of the physical environment and the availability of facilities and infrastructure owned by the school. Interviews were conducted with research informants to complete and confirm the data obtained when conducting observations. Documentation is carried out to obtain supporting data for research. The three types of data collection techniques focus on getting data on learning patterns in schools, communication patterns between school members, and support for infrastructure owned by schools in developing student well-being. The data collection process uses triangulation techniques on data sources, data collection methods, and the theory used.

Data analysis was carried out using techniques developed in qualitative research. The analysis process is followed by data reduction, presentation, and verification. In data reduction activities, there are several steps, namely summarizing all data, coding the data, classifying data, making reflective notes, making marginal notes by providing substantial comments, storing data, and theorizing data by developing researchers' opinions. At the data presentation stage, the data from the previous reduction is presented in an organized manner, arranged in a specific relationship pattern. The authors draw conclusions based on the data obtained at the data verification stage. Some stages of each step may be flexibly and even simultaneously done to reflect the case study.

3. RESULT AND DISCUSSION

Result

This section describes three essential findings related to the success of child-friendly schools in developing student well-being. The three findings are learning patterns that favor students, humanistic social relations between parties, and support for a social environment/infrastructure. Discussion of the results is carried out after presenting each research finding.

Student-friendly learning program

This section discusses two crucial findings related to learning programs in child-friendly schools. The first finding examines the instructional learning process carried out in the classroom. The second finding differs extracurricular activities carried out outside of learning. The two results are shown in Table 1 and Table 2.

Table 1. Instructional Based Learning Activities

No	Statement	Coding
1	This school is a child-friendly school. Therefore, the learning pattern used in this school is learning-oriented to the needs of children so that children feel	Child-friendly orientations

No	Statement	Coding
	comfortable studying at school. Learning aims to develop students' cognitive, affective, and psychomotor abilities. The learning process tries to make students comfortable, enthusiastic, and involved so that the learning material can be understood satisfactorily in school (Subject 1, principal).	
2	The learning materials delivered are generally taught materials such as mathematics, English, and Indonesian. In addition, we also teach religious material. The subject matter also pays attention to students with special needs (Subject 2, vice-principal).	Attention for a student with special need
3	The method used is a learning method oriented to student intelligence by the theory of multiple intelligences. We believe that every student is intelligent in a specific field. Therefore, several lessons are given in groups. Each group is adjusted to the type of student intelligence. (Subject 3, teacher).	Attention to student's multiple intelligences
4	The learning assessment method follows the usual model implemented in various schools. However, this school evaluation also uses an authentic evaluation model. In addition, this school does not group students based on ability (Subject 3, teacher).	Using the authentic evaluations

Table 1 explains that there are four characteristics of a child-friendly school, namely 1) the learning process is carried out to develop cognitive, affective, and psychomotor abilities, which are marked by the achievement of learning mastery standards, high levels of student enthusiasm for learning, and the formation of skills as the result of learning. 2) learning materials are adapted to the needs and abilities of students, which are characterized by attention to students with special needs. 3). Learning uses a method based on student characteristics characterized by multiple intelligences approaches and contextual teaching and learning strategies. And 4) evaluations based on student needs characterized by authentic assessments.

Table 2. Extracurricular Based Learning Activities

No	Statement	Coding
1	Many extracurricular activities are carried out, all of which are oriented towards strengthening school literacy programs and following child-friendly school guidelines (Subject 1, principal).	Literacy program
2	The extracurricular programs are school health efforts and activities to love food, vegetables, and fish. This activity aims to make students physically fit (Subject 2, vice-principal).	Physical health
3	Extracurricular activities that aim to develop a sense of nationalism include scouts, school police, love of the earth, and the Adiwiyata program (Subject 4, teacher).	Nationalism
4	Extracurricular activities to develop students' potential in the arts include drum band activities, dance, and painting. (Subject 4, teacher).	Art
5	Activities to develop students' spiritual potential include reading the Koran program, celebrating religious holidays, praying together, and praying Duha in the congregation (Subject 4, teacher).	Spirituality

Table 2 shows the five findings related to extracurricular activities with student well-being development. The five findings are aspects of academics, physical health, arts and culture, nationalism, and spirituality. Extracurricular activities aim to develop student potential, including development in academic aspects, artistic and cultural potential, development of nationalism and love of nature, spiritual growth, designing physical health, and various sports activities for students. This extracurricular-based learning activity includes multiple programs.

The humanist pattern of social relationships among school members

This section discusses significant findings related to the practice of social relations built-in child-friendly schools. The social relationship in question is between school members such as leaders, teachers, academic staff, students, and parents. The findings are shown in Table 3.

Table 3. The Social Relation Among School Members

No	Statement	Coding
1	The social relationship developed between various schools and students is a relationship of mutual respect and love. The activities carried out were greeting when meeting, shaking hands between students, being polite in behavior, smiling when passing by, and trying to help if someone needed it. (Subject 2, vice-principal)	Respect and love
2	The social relationships among students are relationships built based on mutual respect, love for each other, helping each other, and respect for each other. The activities to develop the above objectives are group study, play, and study tour (Subject 4, teacher).	Respect and love
3	The social relationship built between the school and the parents is a relationship that needs each other and helps each other. Home visits and parenting days are among the school activities to build these relationships (Subject 4, teacher).	Home visit and parenting days program

Table 3 explains that the success of schools in the well-being of students is supported by a pattern of humanistic social relations between parties, which is indicated by the existence of good relationships between teachers and students, staff and students, students and students, and teachers and parents. A good relationship between teachers and students includes concern for the needs of students, as evidenced by the teacher's attention in the form of home visits outside school time. Some forms of relationship patterns between school members can be seen in Figure 1 and Figure 2.

Figure 1. Greeting student to teacher

Figure 2. Relations among students in school

Figure 1 shows that teachers and academic staff welcome and greet students in front of the school. Activities like this are routinely carried out every day before the learning process. Figure 2 shows that students help each other in doing assignments. They respect and appreciate each other so that there are no cases of bullying at the school.

Supporting for environment and facilities

This section discusses the third finding supporting the physical environment and infrastructure in developing student welfare in schools. The results are shown in Table 4.

Tabel 4. School Environmental Support

No	Statement	Coding
1	Classrooms that are owned follow the needs of students. Each room has had learning equipment such as chairs, tables, blackboards, cabinets, and computers. The number of students in one room is only 20 people, so it is ideal for the learning process (Subject 3, teacher).	Ideal classroom
2	Other school equipment to support the modern learning process includes internet facilities for all school members. Especially for students, their use is under teacher monitoring (Subject 5, academic staff).	Internet facilities

No	Statement	Coding
3	The physical environment is complete, starting from a large and beautiful garden, swimming pool, sports field, mosque, toilet, canteen, library, and a full laboratory (Subject 5, academic staff).	Physical environment

Table 4 explains that supporting a social environment and infrastructure is indicated by adequate classrooms, information technology equipment, open spaces, canteens, toilets, prayer rooms, and libraries. A good classroom is characterized by fulfilling safe and comfortable standards for students and supporting effective interactions between teacher-students. Likewise, adequate information technology equipment is characterized by information technology-based learning media following the curriculum, providing learning opportunities, and access to information online.

Figure 3. The classroom

Figure 4. Park and swimming pool

Figure 3 shows the classroom atmosphere owned by the school, while Figure 4 shows the swimming pool and garden facilities owned by the school. Meanwhile, open space is characterized by a garden and playroom that is safe and comfortable for children. In addition, the canteen is characterized by the presence of a clean place and healthy food that meets nutritional standards and adequate toilets characterized by the availability of clean, sufficient, and odorless water. Another no less important room is the prayer room, characterized by a clean and comfortable prayer room. Finally, an adequate library space supports academic activities described by a good collection of books. Table 4 clarifies the findings from interviews with the teacher and academic staff.

Discussion

The findings show that schools apply a pattern of humanistic relationships between schools and various parties, including parents. These results align with several studies that show that student welfare in schools must involve humanistic practices of social relations. The relationship of affection and mutual respect between teachers and students is carried out with kinship, relationships between fellow students who are close and who love each other. In addition, the relationship between teachers and parents is carried out in a familial and mutually supportive manner (Aouad & Bento, 2020; Halladay, 2020). The results of this study are in line with research that found that social support is a child's need. Children need support such as approval, self-esteem, and help from people who have meaning for themselves (Poots, 2020; Ulmanen, 2022). Students who are physically and mentally prosperous will have exemplary achievements and be able to adapt and make social adjustments in their environment well.

The data shows that the school has implemented a student-friendly learning pattern by adopting student-centered learning. Student-centered learning is active, independent learning, and ultimately students are responsible for their education. In principle, student-centered learning has related ideas, namely: (a) knowledge is built by students through active involvement in the learning process; (b) building a knowledge system that is instrumental for the development of knowledge and skills through the transfer of knowledge between students and teachers; (c) the knowledge that is built is more accessible (Adiningrum, 2021; Asimakopoulos, 2021). Thus, it can be further explained that student-centered learning is a learning approach in which students generate learning opportunities and reconstruct knowledge dynamically in an open learning environment. However, schools still provide complete control over this learning pattern. The primary purpose of learning is to explore and increase students' potential, not to equip them with curricula and rules that hinder the development of student potential. Student welfare will be achieved by implementing learning that favors meeting student needs and developing their potential. The application of familiar learning patterns has caused students not to be burdened and not pressured by the

learning process at school and has even increased students' enthusiasm to excel academically and non-academically (Pada, 2021; Syafrudie, 2021). Student academic success will help students improve feelings of happiness and self-esteem

Student welfare will be fulfilled if school welfare is created. School welfare is a psychological climate in schools that provides school members a sense of comfort and happiness, especially students. Students feel prosperous, happy, and enthusiastic about participating in the learning process and feel at home and comfortable participating in teaching and learning activities organized by the school (Anderson, 2022; Dyg, 2018). Thus, school welfare will be able to make children involved in school educational activities and will be an essential factor for students' academic success (McCree, 2018; Rodríguez, 2020). In the context of the development of welfare in schools, school welfare can be created when there is harmony between the school atmosphere, school social relations, personal fulfillment and the presence of physical health, Based on the findings, environmentally friendly support includes adequate classrooms, equipment, information technology, open spaces, canteens, toilets, prayer rooms, and libraries. It is in line with the statement that student welfare and infrastructure support are needed, including environmental management, space for educators and students, length and playgrounds, and even adequate health rooms (Cobanoglu et al., 2018; Virtanen, 2019). The condition of the school (having) includes the physical environment, the environment around the school, and the environment within the school related to the welfare of students in learning activities.

Research related to the role of the school environment on educational outcomes and student development was carried out and found that there was a role for school welfare in academic involvement but not academic achievement. The research found that self-esteem and school welfare play a role in student resilience. It means that in building strength, the part of self-esteem and school welfare is needed simultaneously (Hansen, 2018; Venkatramanan & Shah, 2019). Based on the results of the literature review presented, it can be explained that research on child-friendly school models has differences in terms of research objectives and research methods from previous studies. The research found a relation between the function of educational facilities and infrastructure in supporting the learning process and academic outcome. It is necessary to improve their utilization and management to achieve the expected goals effectively. Several studies have shown that facilities and infrastructure positively affect academic success and well-being (Aldridge, 2018; Tiplady, 2021). These findings necessitate that the fulfillment of facilities and infrastructure is essential to meet the needs of students as subjects as well as objects in education. There are two limitations contained in this study. First, the focus of this research study is limited to the success stories of schools in implementing child-friendly learning processes. Another study that has not been studied in depth is the study of various challenges of becoming a quality school. In addition, efforts to reform and improve the school curriculum in responding to the demands and needs of children are crucial to be studied more deeply. Second, this research process was carried out during the COVID-19 pandemic, which requires discipline in carrying out health procedures. This condition resulted in some difficulties in obtaining data directly. These two limitations are essential aspects to be refined in further research.

4. CONCLUSION

The success of child-friendly schools in developing student welfare is not only due to the completeness of the facilities owned by the school, and the sophisticated curriculum used in learning, but more to the commitment of all school members to be involved in the success of the program. Problems that arise are handled jointly by the school, parents, and the community to develop student welfare. Thus, cooperation between various parties in the implementation of learning in child-friendly schools is the key to educational success. The study's findings necessitate developing child-friendly school education programs in schools as an alternative to developing children's welfare in schools. The child-friendly school model is an educational program that prioritizes a student-centered learning process, respectful and supportive social interactions, and adequate infrastructure support. Policyholders and education implementers should pay attention to these aspects in every child-friendly education program. This study has three significant findings which should be considered in any child-friendly school program.

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Thematic Learning Based on Critical Thinking Skills using Blended Learning System in Elementary School

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ABSTRAK

Pembelajaran di masa pandemi membutuhkan inovasi agar pembelajaran berjalan dengan baik dan mampu mengembangkan keterampilan berpikir kritis siswa. Inovasi dalam pembelajaran salah satunya dengan menerapkan blended learning system dalam pembelajaran tematik. Tujuan dari penelitian ini untuk menganalisis perencanaan, pelaksanaan, dan hasil pembelajaran tematik berbasis keterampilan berpikir kritis menggunakan Blended Learning System (BLS) pada peserta didik kelas V di sekolah dasar. Jenis penelitian ini deskriptif kualitatif menggunakan pendekatan studi kasus dengan subjek penelitian 37 peserta didik kelas V sekolah dasar. Teknik pengumpulan data dalam penelitian ini melalui observasi secara langsung, wawancara, dan dokumentasi berupa data yang berkaitan dengan penelitian guna memperkuat informasi. Data yang telah terkumpul kemudian dikelompokkan dan divalidasi dengan teknik triangulasi sumber dan triangulasi teknik, data dianalisis dengan langkah reduksi data, penyajian data, dan penarikan kesimpulan. Hasil penelitian ini yaitu: 1) Perencanaan pembelajaran tematik berbasis keterampilan berpikir kritis dengan blended learning system di sekolah dasar diawali dengan penyusunan dokumentasi kurikulum, kemudian kegiatan sosialisasi, selanjutnya dilaksanakan kegiatan IHT (In House Training), dan penyusunan silabus dan Rencana Pelaksanaan Pembelajaran (RPP) tematik berbasis keterampilan berpikir kritis. 2) Pelaksanaan pembelajaran tematik berbasis keterampilan berpikir kritis dengan blended learning system memadukan pembelajaran tatap muka dan pembelajaran online yang mampu mengakomodasi kemampuan berpikir kritis peserta didik melalui rangkaian kegiatan pembelajaran yang diterapkan. 3) Hasil pembelajaran tematik berbasis keterampilan berpikir kritis memperoleh kategori baik yang mencakup penilaian aspek kognitif, afektif, dan psikomotorik.

ABSTRACT

Learning during a pandemic requires innovation so that learning runs well and can develop students' critical thinking skills. One of the learning innovations is applying a blended learning system in thematic learning. This study aimed to analyze the planning, implementation, and thematic learning outcomes based on critical thinking skills using a blended learning system for fifth-grade students in elementary schools. This type of research is descriptive qualitative using a case study approach with a subject of 37 fifth grade elementary school students. Data collection techniques in this study through direct observation, interviews, and documentation in the form of data related to research to strengthen the information. The data that has been collected is then grouped and validated by source triangulation and triangulation techniques. The data is analyzed by data reduction, data presentation, and conclusion drawing. The results of this study are 1) Planning of thematic learning based on critical thinking skills with a BLS begins with the preparation of curriculum documentation, socialization, then IHT (In House Training) activities, and the preparation of syllabus and Learning Implementation Plans (RPP) thematic based on critical thinking skills. 2) Implementation of thematic learning based on critical thinking skills with a blended learning system combining face-to-face learning and online learning that can accommodate students' critical thinking skills through a series of applied learning activities. 3) The results of thematic learning based on critical thinking skills obtained a good category which includes an assessment of cognitive, affective, and psychomotor aspects.

1. INTRODUCTION

Learning during a pandemic requires innovation so that thematic learning runs well and can develop students' critical thinking skills. One of the learning innovations is applying a blended learning system in thematic learning. Education aims to create quality, faithful and devoted students to God based on cultural and Pancasila values. Primary education aims to develop students' skills, attitudes, and knowledge (Sujana, 2019; Wuryani & Yamtinah, 2018). It can be concluded that the purpose of education is

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a continuous process that aims to develop children's abilities to become quality human beings who have religious values based on cultural values and Pancasila. The Covid-19 pandemic in Indonesia impacts changes in the learning order, so learning appropriate to the situation and conditions is needed to provide a meaningful learning experience for students. The Covid pandemic has impacted the country's welfare, including the education sector, because classroom learning will be affected, and it is a big threat to human life. The covid-19 pandemic has had a devastating impact on education, creating barriers for students currently pursuing education and potentially changing their future career paths (Dhanalakshmi et al., 2021; Miani et al., 2021; Mulugeta, 2021).

The development of education is realized by the 2013 curriculum applied in Indonesia. The curriculum is an integrated thematic-based learning consisting of more than one subject based on a theme. Thematic learning is learning with no separate topics, is flexible, fosters talent, critical thinking skills, and students' social abilities. Thematic learning aims to create meaningful and comprehensive learning and plays an essential role in increasing students' attention, learning activities, and understanding of school learning materials (Ananda & Fadhilaturrahmi, 2018; Narti et al., 2016; Novika Auliyana et al., 2018). It can be concluded that thematic learning is learning based on a theme that contains several integrated learning contents so that there is no separation between subjects and is flexible, which aims to foster critical thinking skills, creativity, social skills, as well as interests and talents according to students' abilities. In the era of the 21st century, students are expected to have critical thinking skills to solve problems that occur in social life. A person with critical thinking skills can analyze and make decisions well when encountering a problem. It is necessary to develop a learning model centered on students improving critical thinking skills so that it is easier to build an understanding of learning materials and students are more active in finding their knowledge (Lieung, 2019; Simanjuntak & Sudibjo, 2019). Government regulation number 20 of 2016 concerning graduate competency standards states that elementary school graduates are expected to have critical thinking skills.

Thematic learning in elementary schools is expected to accommodate students' critical thinking skills through appropriate knowledge of the current situation. Thematic learning based on problem-solving skills can improve the learning achievement of elementary school students (Syofyan et al., 2019). Based on this, it is necessary to develop thematic learning to realize the nation's next generation who have critical thinking skills to solve problems in the community. During the pandemic and post-covid-19 pandemic in Indonesia, education is needed to accommodate critical thinking skills so that effective and efficient learning can be realized to develop students' critical thinking skills at school. One of the learning systems in the current situation is a blended learning system. This is appropriate in the covid-19 pandemic situation because it can facilitate learning and is expected to accommodate critical thinking skills because students must be active in participating in learning activities.

A blended learning system is a learning system that combines face-to-face and technology-based learning online. According to students learning materials, teachers can use technology in the learning process through mixed learning. With efforts to prevent the spread of the new coronavirus, online learning has become a teaching tool to catch up with the curriculum (Fazal & Bryant, 2019; Muthuprasad et al., 2021; Widiara, 2018). Blended learning as a solution to learning problems and improved learning outcomes in elementary schools, students can gain meaningful learning experiences. A blended learning system in school can affect students' critical thinking skills (Anggraeni Anggian, Supriana Edi, 2019; Prescott et al., 2018; Seage & Türegün, 2020). It can be concluded that the blended learning system is a learning system that utilizes technology that aims to develop critical thinking skills and provide meaningful experiences for students while studying in elementary school.

Based on the observations, SD Negeri 9 Boyolali is a superior school in Boyolali which became a thematic learning pilot project using a blended learning system as a step of development and innovation in learning and as a way to break the chain of the Covid-19 virus in the elementary school environment. It was found that the implementation of thematic learning with a blended learning system was supported by 100% of students in high grades having mobile phones and internet access, and we were able to support the implementation of the learning process during the pandemic. In addition, the characteristics of students who are technology literate facilitate the learning process, evidenced by the fact that almost all students can access and use their cell phones properly. The world is always changing and evolving, so we must always aspire to move forward and try to develop a learning system in schools. Internet facilities can facilitate the learning process that will benefit students and can encourage students to learn (Dhanalakshmi et al., 2021; Sindiani et al., 2020).

However, in the implementation of thematic learning, there are still problems. Namely, some teachers have low mastery of technology. Problems must be resolved immediately so that thematic learning through the blended learning system can accommodate students' critical thinking skills in elementary school to achieve educational goals. Based on the above, good learning management is needed. Teachers

need to organize creative learning by applying a BLS to integrate critical thinking skills (Prafitasari et al., 2021). Stages of thematic learning in elementary schools include planning, implementation, and assessment of learning (Suhartono, 2021; Syaifuddin, 2017).

This study aims to analyze the implementation of thematic learning based on critical thinking skills with a BLS in elementary schools, including planning, implementation, and the results of the thematic learning assessment based on critical thinking. This research can be used as reference material for other elementary schools in Indonesia regarding thematic learning during the pandemic and post-covid-19 pandemic. The implementation of thematic learning based on critical thinking skills with blended learning has implications for the development and innovation of thematic learning with a BLS that can accommodate students' critical thinking skills. This study recommends that teachers continue to develop competencies in interesting learning strategies and use technology in learning to follow the development of the situation.

2. METHOD

This research is descriptive qualitative with a case study approach that aims to analyse the implementation of thematic learning based on critical thinking skills using a BLS. The flow of this research is presented in Figure 1.

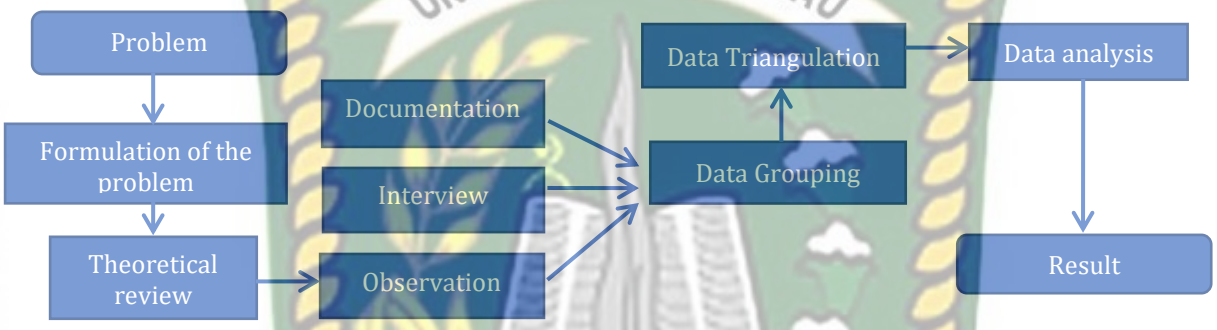

Figure 1. Research Design

The subjects of this study were 37 students and one teacher of class V at public elementary school 9 Boyolali Regency, Central Java, Indonesia. The data collection techniques in this study were through direct observation, interviews with the headmaster, teachers, and students of class V to obtain complete data, and thorough documentation in the form of data related to research to strengthen information. Validation of data by triangulation of sources and triangulation of techniques to determine the credibility of the data by using various techniques, including direct observation, documentation, and interviews. Then triangulate data sources obtained from school principals, teachers, and students. Data analysis was carried out using data reduction, data exposure, and conclusion (Miles & Huberman, 2014). The research instrument used is as shown in Table 1.

Table 1. Instrument Grid Critical Thinking Skills in Thematic Learning using BLS

No	Aspect	Description
1.	Problem Solving	1. Accurate 2. Problem analysis 3. Finding solution
2.	Self-Confidence	1. Able to answer question 2. Able to provide arguments 3. Present the work with confidence
3.	Open-minded	1. Have an attitude of tolerance 2. Respect the opinion of others 3. have broad insight

The results of the cognitive, affective, and psychomotor learning scores obtained were averaged then the scores were categorized according to the categories as shown in Table 2.

Table 2. Category of the Thematic Learning Assessment with the Blended Learning System

Predicate	Score Range			Category
	Cognitive	Affective	Psychomotor	
A	94 – 100	94 – 100	Very Good	Very Good
B	88 – 93	88 – 93	Good	Good
C	80 – 87	80 – 87	Enough	Enough
D	≤80	≤80	Need Guidance	Need Guidance

3. RESULT AND DISCUSSION

Result

Planning

Learning planning begins with preparing a school curriculum document that contains the school's vision and mission, school goals, curriculum content, learning load, and an educational calendar. Then socialization was carried out for parents of students through plenary meeting activities. IHT (In House Training) provides training to teachers related to learning management and increases teacher competence in using technology in learning. Furthermore, the preparation of the learning syllabus follows the current conditions (covid-19 pandemic) by teachers whom the principal accompanies. Finally, the teacher accompanied by the headmaster, prepares a Learning Implementation Plan (RPP) based on critical thinking skills by including operational verbs (KKO) C4 (analyze) and C6 (create) which accommodates one of the 21st-century skills, namely critical thinking skills.

Implementation

Implementation of thematic learning based on critical thinking skills with a blended learning system is a good category. Thematic learning can accommodate students' critical thinking skills, as evidenced during face-to-face and online learning. Students can analyze material, have confidence and have an open mind during the learning process. The implementation is presented in Table 3.

Table 3. Implementation of the Thematic Learning

Type of Learning	Time Allocation	Learning Media	Learning Resources
Face to face learning	Monday, Wednesday, Friday Session 1: 07.00 until 09.00 WIB Session 2: 10.00 until 12.00 WIB	LKPD, PowerPoint, and SCI (Smart Center Indonesia) electronic learning media.	Student thematic learning book and teacher thematic learning book.
Online Learning	Tuesday, Thursday, Saturday 07.00 until 12.00 WIB (Project-based learning)	WhatsApp application, zoom meeting, quizziz application, YouTube, google form, and SCI media.	Student thematic learning book, teacher thematic learning book, and internet access.

Outcomes

Thematic learning assessment using a blended learning system with authentic assessment includes an assessment of psychomotor, cognitive, and affective aspects with details of the results of the assessment as shown in Figure 2, Figure 3, and Figure 4.

Figure 2. Psychomotor Score Results

The assessment of the psychomotor aspect in Figure 2 obtained a good category with an average score of 88 and was able to accommodate students' critical thinking skills in elementary schools.

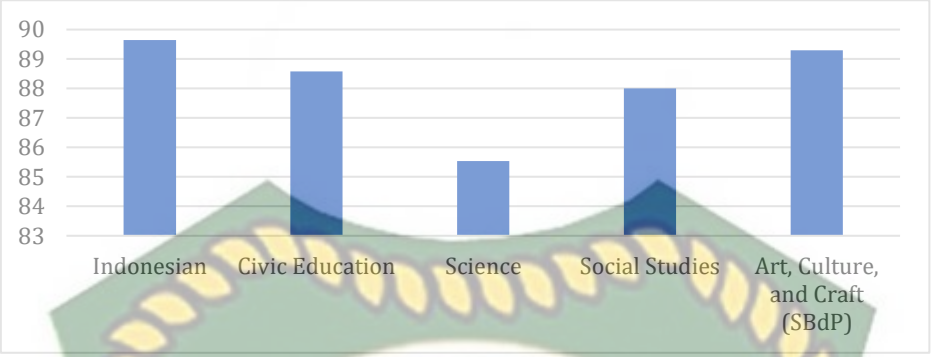

Figure 3. Cognitive Score Result

The cognitive aspect assessment in Figure 3 obtained a good category with an average score of 88.5 and accommodated students' critical thinking skills in elementary schools.

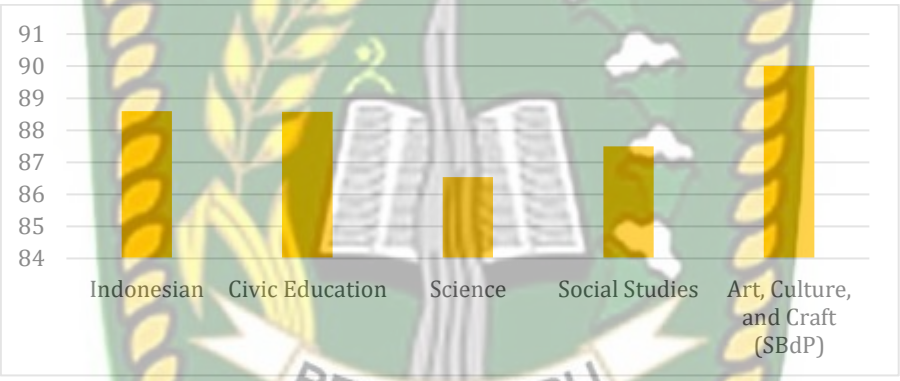

Figure 4. Affective Result

The affective aspect assessment in Figure 4 obtained a good category with an average score of 88.2 and accommodated students' critical thinking skills in elementary schools.

Discussion

The planning stage begins with preparing a school curriculum document containing the school's vision and mission, school objectives, curriculum content, learning load, and educational calendar. Thematic learning using a scientific approach can train students to develop and improve cognitive, affective, and psychomotor skills so that careful planning is needed. Learning in elementary schools has a great function and influence in building students' cognitive, affective, and psychomotor construct. Managing the learning system and determining appropriate learning strategies, curriculum, and materials can improve student participation and time efficiency (Vilda & Asmayani, 2021; Liana, 2020; Romadhon et al., 2019). Then the school carried out outreach activities to school residents regarding the learning process during the pandemic. Socialization activities for parents of students are carried out through plenary meetings held at the beginning of the semester to convey information related to learning preparation and provide understanding to students so that they can adapt to changes in the order of the learning process new normal era. Socialization helps give knowledge on blended learning systems to prepare engaging learning media (Martiarini & Lestari, 2020).

Schools conduct debriefing for teachers through In House Training (IHT) activities. This activity provides training to improve teacher competence related to blended learning system learning preparation. In-house blended learning training can add new insights about blended learning strategies that can be implemented in the classroom teaching process during the COVID-19 pandemic to become more varied and innovative. Teachers need training on using different tools and learning modalities in complementary and flexible ways, adapting to student needs. The teacher must create a work environment at home and use telecommunications for teaching (Indrawan et al., 2021; Penha et al., 2021; van Cappelle et al., 2021). Using

IT and the use of electronic learning devices are expected to support the learning process in schools. These activities include training on the use of the WhatsApp application, zoom meeting, google meet, google forms, quizziz, and other learning media. IHT is held in schools or other places using equipment and materials relevant to the problems faced to develop affective, cognitive, and psychomotor competencies. Blended learning system training is helpful for needs, and follow-up training requires adequate time and modules as learning handles (Ayuningtyas et al., 2017; Ivone et al., 2020).

The thematic Learning Implementation Plan (RPP) refers to Government Regulation number 14 of 2019. The preparation of RPP has a good category and contains a complete identity, the formulation of learning indicators uses Operational Verbs (KKO), C4 (analyses) and C6 (creates) to accommodate critical thinking skills. The formulation of learning objectives includes aspects of audience, behavior, condition, and degree (ABCD). The learning steps in the lesson plan already have activities that accommodate critical thinking skills, as evidenced by learning activities that include critical thinking skills such as analyzing and creating work. Critical thinking is students' ability to reason, express, analyze, and solve problems (Indraswati et al., 2020). Learning planning is a process of determining plans for learning activities that will be carried out in an integrated and systematic way. The plans made are poured into the lesson plan. The concept of problem-solving is part of critical thinking (Karakoc, 2016; Nainggolan, 2020). Assessment of thematic learning is carried out authentically, including cognitive, affective, and psychomotor. The authentic assessment aims to determine students' understanding and potential and can be used for planning improvement programs, enrichment, or counselling services (Novika Auliyana et al., 2018; Suhartono, 2021). Teacher competence in compiling syllabus and lesson plans is important. Assessment is an activity used to find out progress students from the beginning to the end of the learning used to prove the learning process. Knowledge assessment is used for written tests, oral tests, and project assignments with worksheets to measure the level of student mastery of KD. Psychomotor assessment is carried out using observation techniques, while skills assessment is used to determine students' skills in mastering KD (Novika Auliyana et al., 2018; Rahma & Fatonah, 2021; Susetya, 2017).

Thematic learning with a BLS based on critical thinking skills is combined with limited face-to-face and online learning (PJJ) to get a good category. Thematic learning can accommodate students' critical thinking skills. Students can solve problems, have self-confidence, and have an open mind during the learning process. Blended learning systems can support upcoming changes in learning to provide meaningful experiences centered on the needs and abilities of students (Dziuban et al., 2018; Lazem, 2019). A blended learning system is an important education method and effectively increases knowledge and learning quality. Blended learning can be applied using the following combinations 50/50 means 50% online learning and 50% offline learning advance (Abdullah, 2018; Alsalhi et al., 2019; Penha et al., 2021).

Implementing learning with a blended learning system is carried out by combining online and face-to-face learning. Face-to-face learning is carried out on Monday, Wednesday, and Friday, divided into two sessions. Each session is only attended by a maximum of 50% of the total number of students. Session 1 learning is held from 07.00 WIB to 09.00 WIB, followed by 18 to 19 students, and session two learning is carried out from 10.00 WIB to 12.00 WIB, followed by 18 to 19 students so that learning remains conducive and maintains health protocols. Sources and learning media used are student books, teacher books, LKPD, and SCI (Smart Center Indonesia) electronic learning media. Teachers in elementary schools can use thematic book teaching materials because they provide teaching materials according to the 2013 Curriculum. Applying thematic-based character education textbooks in thematic learning so that students do not feel bored or tired of studying (Sudiana et al., 2019; Wuryani & Yamtinah, 2018).

Online learning or distance learning (PJJ) is held on Tuesdays, Thursdays, and Saturdays from 07.00 WIB to 12.00 WIB with project-based learning. Students participate in independent learning accompanied by parents from their respective places of residence by utilizing electronic devices. Blended learning utilizes technology to support learning as an alternative path according to the local culture in a country. Effective learning can teach students to use communication tools via computers such as the internet (Resien et al., 2020; S. Yang, Allen, et al., 2021). Although learning is carried out remotely, it does not reduce students' enthusiasm for participating in thematic learning. Students can continue to study quietly from home, guided by the teacher and with parental assistance. The role of parents in assisting and guiding students to study at home is quite effective in overcoming student learning anxiety. Advances in Internet technology have changed how several classrooms can be combined so that they can be fully integrated with various electronic devices (Anggraeni et al., 2021; J. Yang et al., 2019).

Online learning utilizes several applications that can be accessed via mobile devices or laptops owned by students. These include the WhatsApp application, zoom meeting, quizziz application, YouTube, google forms and SCI media used as media and learning resources in the learning process. The application of the blended learning system requires teachers to be creative in using learning platforms in the form of YouTube links, videos, and PowerPoint. Student activity on google meet and parents accompanying

students during the pandemic with online learning. Blended learning systems create active learning to create more meaningful learning and can be used to support the learning process. In the era of the development of internet technology, it can be used for learning through WhatsApp groups, Google Class, Google Forms, and Zoom (Aritonang et al., 2021; Ni Komang Suni Astini, 2020; Risdianto et al., 2021).

Thematic learning outcomes with the blended learning system can accommodate students' critical thinking skills reflected in the learning assessment. Learning assessment uses a blended learning system through online and face-to-face learning in class and is flexible according to school conditions (Nasir, 2021; S. Yang, Carter, et al., 2021). The authentic assessment of thematic learning already covers the cognitive, affective, and psychomotor aspects. The assessment includes "affective involvement," "cognitive" involvement," and "psychomotor involvement," contributing to the learning experience for students (Xu & Zammit, 2020). The results of the cognitive domain assessment are in a good category, meaning that learning can accommodate critical thinking skills through HOTS (High Order Thinking Skills) questions. High order thinking skills learning is well designed and applied to increase knowledge and students' higher-order thinking skills (Kwangmuang et al., 2021). The results of the assessment of the affective domain get a good category, as evidenced by the work of students who get a good category. Psychomotor learning outcomes get a good category as evidenced by student learning outcomes that have shown critical thinking skills.

4. CONCLUSION

The implementation of thematic learning based on critical thinking skills with a BLS in elementary schools has a good category. Planning begins with the preparation of curriculum documents, socialization, IHT (In House Training), syllabus preparation and thematic Learning Implementation Plans (RPP) based on critical thinking by including operational verbs (KKO) C4 (analyze) and C6 (create) and learning objectives include aspects of audience, behavior, condition, and degree (ABCD). Thematic learning based on critical thinking skills with a blended learning system combines face-to-face and online learning to accommodate students' critical thinking skills through a series of learning activities that require active students through interesting and interactive activities that have good learning outcomes, including assessment of cognitive, affective aspects, and psychomotor. The obstacle faced was that some students were late in submitting assignments. Suggestions to minimize these obstacles are that teachers must always guide students in learning to remain disciplined and responsible and give awards to students who are timely in collecting assignments to increase student enthusiasm.

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Inquiry Model: How to Improve the Ability of the Nature of Science and Its Aspects in Elementary School?

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ABSTRAK

Hakikat sains dan merupakan sesuatu yang sangat penting untuk diajarkan di sekolah dasar. Dilapangan belum banyak penelitian yang melibatkan model pembelajaran dalam upaya pengembangan hakikat sains, baik dari dimensi sains maupun sifat-sifat sains itu sendiri. Tujuan dari penelitian ini adalah untuk mengungkap bagaimana model inkuiri berpengaruh terhadap kemampuan hakikat sains dan sifat pada siswa di sekolah dasar. Metode yang digunakan adalah kuantitatif dengan desain pre eksperimental jenis pre-test dan post-test one group design. Subjek dari penelitian ini adalah siswa kelas V sekolah dasar dengan sampel penelitian sebanyak 36 siswa. Instrumen dalam penelitian ini menggunakan soal tes (produk), lembar observasi siswa (proses) dan angket (sikap). Hasil penelitian menunjukan data bahwa P-value = 0,000 < 0,05. Jadi H_1 diterima. Dengan demikian, pembelajaran dengan model inquiry meningkatkan secara signifikan dimensi produk (kognitif) siswa di sekolah dasar. Pengukuran dimensi proses melalui observasi nilai rata-rata mencapai 58,2% dan ada dikategori cukup. Untuk mengukur dimensi sikap menggunakan angket dalam mengukur 10 sifat dasar sains, penganalisisan data ada pada kriteria baik. Secara umum model inquiry dapat memberikan pengaruh terhadap kemampuan hakikat sains dan sifat pada siswa di sekolah dasar. Untuk penelitian selanjutnya dapat dikembangkan menggunakan model/pendekatan/ stategi/metode lain, guna meningkatkan kemampuan siswa terhadap hakikat sains dan sifat-sifatnya.

ABSTRACT

The nature of science and is something that is very important to be taught in elementary schools. In the field there are not many studies that involve learning models in an effort to develop the nature of science, both from the dimension its aspects and the nature of science itself. The purpose of this research is to reveal how the inquiry model affects the ability of the nature of science and its aspects of students in elementary school. The method used is quantitative with a pre-experimental pre-test and post-test one group design. The subjects of this study were fifth grade elementary school students with a sample of 36 students. The instruments in this study used test questions (products), student observation sheets (process) and questionnaires (attitudes). The results showed that the P-value = 0,000 < 0,05. So H_1 is accepted. Thus, learning with the inquiry model significantly increases the product dimensions (cognitive) of students in elementary schools. The measurement of process dimensions through observation has an average value of 58.2% and is in the sufficient category. To measure the dimensions of attitude using a questionnaire in measuring the 10 basic properties its aspects, data analysis is on good criteria. In general, the inquiry model can have an influence on the ability of the nature of science and its aspects of students in elementary schools. For further research, it can be developed using other models/approaches/strategies/methods, in order to improve students' ability to the nature of science and its aspects.

1. INTRODUCTION

The 2018 PISA survey related to the acquisition of scientific literacy skills, again showed unsatisfactory results. Indonesia was ranked 72 out of 80 participating countries with a score of 396 (J. B. Kelana et al., 2021; Nurhanurawati, N. et al., 2019). This is something that is worrying in the midst of the government's efforts to improve literacy and numeracy skills. Many studies have discussed the weakness of scientific literacy skills. The average research leads to students' understanding of the nature of science (Khishfe, 2017; William F. McComas, 2015; Putri et al., 2021). The nature of science is one of the important elements in scientific literacy, because it is the main goal of learning IPA (Yanuar & Widodo, 2021). If you look at several reference sources related to the nature of science, there is no specific agreement on the definition. But in general it can be concluded that the nature of science is an aspect related to products, processes and attitudes and their characteristics (Glynn & Winter, 2004; Lorsbach et al., 2019) The nature of science is an aspect that cannot be separated from science. To understand the nature of science we need

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to understand the concept of knowledge which includes philosophical, sociological, and historical (Kampourakis, 2016). The nature of science refers to the epistemology of knowledge and sociology, namely knowledge as a form of knowledge or evaluation and belief which is the essence of scientific knowledge (Mudavanhu & Zezekwa, 2017). Science is basically based on the assumption that the natural world can be derived from human understanding of ontology, epistemology, and value theory (Jiang & McComas, 2014).

Previous literature explained that the nature of science includes products, processes and attitudes (Hacieminoglu, 2014). Science as a product includes principles, laws and theories related to nature and the various phenomena that occur in it. Science as a process is better known as science process skills, which are a number of skills to study all natural phenomena in a certain way and to acquire and develop that knowledge. Science as an attitude is an attitude that scientists have in seeking and developing their knowledge, for example: being responsible, objective, careful, etc. Meanwhile, in the latest literature related to the nature of science, more emphasis is placed on the properties of science (Widodo, 2021). The nature of science is concerned with (1) scientific knowledge is not completely objective; (2) scientists use creativity; (3) scientific knowledge is tentative; 4) scientific knowledge is socially and culturally embedded; (5) law and theory are different types of knowledge; (6) scientific knowledge is based on empirical; (7) there is no fixed scientific method; (8) there is a difference between observation and conclusion; (9) science is limited; (10) cooperation and collaboration are needed to develop knowledge; (11) there is a difference between science and technology; (12) experiments have an important role in science (William F. McComas, 2015). There are seven properties of the nature of science including: (1) tentative, (2) subjective, (3) empirical, (4) scientific method, (5) socio-cultural, (6) theory and law and (7) creative (Ari Widodo et al., 2019). If examined in more depth there is no difference from these opinions, the only difference is from the point of view that certain aspects are important to be raised separately.

The application of the nature of science, especially in elementary schools is still low (Nugraheny, D. C., & Widodo, 2021; Sutinah & Widodo, 2020). Based on the findings in the field, teachers still feel unfamiliar with this term (Jumanto & Widodo, 2018). The reasons why the nature of science is very important to be developed, including: (1) Utilitarian, the nature of science is needed to understand science and its use in everyday life, (2) Democratic, the nature of science is needed for making a decision related to socioscientific, (3) Cultural, the use of knowledge related to scientific values as part of contemporary culture, (4) Moral, the nature of science helps develop an understanding of useful norms about general values in society, (5) Science learning, the nature of science bridging material related to science learning (W. F. McComas, 2017). Another factor is that there are still many learning designs made by teachers in the classroom that seem monotonous. This can lead to boredom or burnout. Such learning makes students unmotivated to learn (Andrini, 2016; D. S. Wardani et al., 2021). Previous research has shown that the nature of science is very important to be taught, especially at the elementary school level. Efforts that can be made to develop the nature of science are to use learning models that can stimulate elementary school students to be active and find their own knowledge through investigation so that they can improve their skills and knowledge independently. One of them is by using the inquiry model.

The inquiry model is a learning activity that prepares students to do something, use the symbols they find, make questions and find answers to their own questions (Maaß & Doorman, 2013; Schallert et al., 2020). The steps of the inquiry model include: (1) formulating questions, (2) planning an investigation, (3) carrying out an investigation, (4) analyzing data, (5) drawing conclusions and (6) communicating (Eggen & Kauchak, 2012). Through this learning step, it encourages students to be active, think critically, discover and explore their knowledge so that they can confidently formulate their findings (Jajang Bayu Kelana & Wardani, 2021). In addition, inquiry in science learning focuses on the involvement of students in developing their real knowledge, both related to concepts or scientific reasoning skills. Learning science is not only memorizing scientific facts and information, but also about how to understand, apply scientific concepts and methods in everyday life (Jocz et al., 2014; Lazonder, 2013). The explanation above proves that the inquiry model can be used in science learning. Previous research has not involved many learning models in an effort to develop the nature of science in the form of product dimensions, processes and attitudes and characteristics. For this reason, the purpose of this researcher is to reveal how the inquiry model affects the ability of the nature of science and its nature in elementary school students.

2. METHOD

This study uses a quantitative method with a pre-experimental design type of pre-test and post-test one group design (Creswell, 2014). This method was chosen because the data selected was only one group and without a comparison group. The research design is presented in Table 1.

Table 1. Research Design

	Pretest	Treatment	Postest
Grup	O_1	X	O_2

To streamline time, cost and effort, the research subjects were chosen as representatives of the population. The subjects of this study were fifth grade elementary school students with a research sample of 36 students and assumed to have the same characteristics. The instrument was prepared based on a planned learning design and was validated in the field and then validated to experts and colleagues who also conducted similar research with other learning designs. The components in the nature of science include products, processes and attitudes, for that the instruments in this study used test questions (products), student observation sheets (process) and questionnaires (attitudes). The test instrument used to measure the product (related to cognitive) is 10 questions. The description of the cognitive dimensions in this test is as shown in Table 2.

Table 2. Product Dimensions (Cognitive)

Cognitive	Aspect	Total
C1	Recognize	2 items
C2	Give an example	4 items
	Classification	1 item
C3	Implementation	2 items
C5	Evaluation	1 item

The process dimension uses student observation instruments consisting of observing, experimenting, processing data and communicating. While measuring the dimensions of attitude using a questionnaire. This instrument uses a Likert scale (4,3,2,1) which consists of 20 statements. The statements contained in the questionnaire are also related to the properties that exist in science. There are 10 properties developed, for more details can be seen in Table 3.

Table 3. The Nature of Science

Aspects	No item	Total
Tentative	1, 2, 3	3
Subjective	4,5	2
Empirical	6,7,8,9	4
Socio-cultural	10,11	2
Limitations	12,13	2
Scientific method (process)	14	1
Scientific method (attitude)	15,16	2
Law and theory	17	1
Science and technology	18	1
Creative	19,20	2
Total		**20**

The procedure in this research can be described as follows: 1) the preparation stage includes the licensing process to the school, determining research samples, studying literature, making instruments and testing instruments. the instrument was compiled, consulted with experts and then validated and analyzed using the help of Ms. Excel and SPPS 23; 2) the implementation stage, including giving pretest-posttest, giving treatment using the inquiry model and observing students during the learning process. 3) the evaluation stage includes collecting, processing and analyzing data from research that has been carried out previously. The design for the use of the inquiry model in the development of the nature of science and its nature is as shown in Table 4.

Table 4. Stages of the Inquiry Model in Learning

Structure in Students	Stages Structure	Model in Teachers
Thinking and asking questions about a phenomenon then determining the questions to find out the answer to	Formulating research questions	Formulating research questions Raising conditions that arouse students' curiosity

Structure in Students	Stages Structure	Model in Teachers
Plan the steps to answer the question you want to know the answer to	Planning an investigation	Directing the research design will be carried out by students
Gather the evidence needed to answer the question	Carry out research	Guiding students to carry out investigations and data collection
Analyze the suitability of the evidence obtained with the questions	Analyze data	Directing how to interpret the evidence obtained by students
Making conclusions based on the evidence obtained	Conclusion	Help find patterns and relationships of data owned by students
Communicating the results obtained	Communicating	Communicating the results obtained
Communicating the results obtained	inquiry	Generate new problems to strengthen the inquiry skills that have been learned

The data obtained from the results of this study are divided into quantitative and qualitative data. Quantitative data were obtained from test questions, both pretest and posttest. Pretest and posttest result data is needed to see the extent to which students' mastery of product (cognitive) dimensions before and after learning is given. Data analysis regarding this initial ability was obtained through a pretest. The questions used in the pretest are questions that have been tested first with specified validation and reliability. After being given treatment, students were given a posttest at the end. Qualitative data obtained from student observation data and questionnaires. For student observation data, it is adjusted based on the grid that has been made. Students were observed their learning activities using the instrument. Then see what the total percentage for each meeting is and interpreted using the criteria Table 5.

Table 5. Student Observation Criteria

%	Interpretation
81 % - 100%	Very well
61 - 80%	Good
41 - 60%	Enough
21 % - 40%	Not enough
0 % - 20 %	Less once

The questionnaires were analyzed based on the nature of the nature of science, then described, compared with one another and conclusions were drawn from the results of the research.

3. RESULT AND DISCUSSION

Result

The results of this study related to student mastery in the product dimension (cognitive) are as shown in Table 6.

Table 6. Result of product dimension analysis (cognitive)

Data Type		Pretest	Postest
N		36	36
Mean		5.81	7.25
Std. Deviation		2.471	1.592
Std. Error Mean		0.412	0.265
Normality test	Sig.	0.062	0.216
	Description	Normal	Normal
t-Test	Sig.2-*tailed*	0.000	
	Description	Significant	

From the data in Table 6, the average pretest data was 5.81. Meanwhile, the posttest average value is 7.25. The number of students used as the research sample was 36 students. Std value. Deviation in the pretest is 2.471 and the post-test is 1.592. For the value of Std. Mean error for pretest is 0.412 and for post-test is 0.265. Based on these data, the mean value of pretest was 5.81 < posttest was 7.25. So, it can be said

that there is a difference in the average cognitive ability of students. Based on the normality test, it is known that the results of the pretest and posttest data have P-values (Sig.) of 0.062 and 0.216, respectively. Thus, the pretest and posttest P-value (Sig.) data is greater than = 0.05, so H_0 which states that the data comes from a normally distributed population is accepted. That is, the posttest and pretest data are normally distributed.

Homogeneity testing between pretest and posttest was conducted to determine whether the variance of the two test classes was the same or different. It is known that the results of the homogeneity test have a P-value (Sig.) of 0.124 which is greater than = 0.05, such conditions indicate that H_0 is accepted. Thus, there is no difference in test variance or it can be said that the data is homogeneous. Furthermore, for further evidence, the paired sample t test will be used at a significance level of = 0.05. The P-value (Sig.2-tailed) is 0.000. Because P-value (Sig.1-tailed) is required, the P-value (Sig.2-tailed) 0.000/2 = 0.000 is smaller than 0.05. So H_0 is rejected and H_1 is accepted. Thus, learning with the inquiry model significantly increases the product dimensions (cognitive) of students in elementary schools. To measure the mastery of the process dimensions using student observation instruments. The aspects observed in the observation instrument include: observing, experimenting, processing data and communicating. The recapitulation of the results of student observations during the learning process is Based on the data above, there was an increase in student activity during learning. The first meeting the percentage reached 54.7% and the second meeting the percentage reached 62.3%. The average value reaches 58.2% and if it is interpreted there is a sufficient category.

The questionnaire was used to measure the mastery of the attitude dimension. This instrument is given to students after the learning is carried out. The questionnaire given contains 20 statements covering 10 traits in the nature of science. Each statement contains four responses, namely the words SS (strongly agree), S (agree), TS (disagree), and STS (strongly disagree). Table 7 present the results of the questionnaire that has been given to students.

Table 7. Recapitulation of Questionnaire Results with their Characteristics

No	Characteristic	%
1	tentative	83.33
2	Subjective	77.08
3	Empirical	82.12
4	Socio-cultural	79.86
5	Limitations	78.47
6	Scientific Method (Process)	85.42
7	Scientific Method (Attitude)	74.65
8	Law and Theory	84.72
9	Science and Technology	86.11
10	Creative	80.21
	Average	**81.20**

The result of the interpretation of the questionnaire in the table above shows that the one that gives the biggest contribution is the nature of science and technology at 86.11%. While the smallest trait is the nature of the scientific method (attitude) of 74.65%. The difference between the properties of one and the other does not contribute much difference. The average value of the nature of science is 81.20% or in good criteria.

Discussion

Increased ability in the science learning process is closely related to the mastery of the nature of science. For this reason, a good understanding of the teacher is needed to design learning that can develop mastery of the nature of science in students (Dogan & Abd-El-Khalick, 2008);(Kelana, dkk, 2021). The nature of science is not only limited to the dimensions of products, processes and attitudes, more broadly it must develop the properties that are in it as well. Science is seen as a product because it studies and examines phenomena that occur in nature scientifically and systematically. Research will produce a product in the form of theories, principles, laws and facts that are useful for human life. Science as a product contains principles, laws, and theories that can explain and understand nature and the various phenomena that occur in it (Bundu, 2006);(Wardani,, et al., 2021). The results of the study show that through the application of the inquiry model, it can be an alternative to develop product dimensions (cognitive) (Ong et al., 2021);(Hastuti et al., 2020). Students' ability to recognize, give examples, classify, implement and evaluate is honed by applying this model. The inquiry model provides the widest opportunity for students to find and investigate the concepts they are learning. Based on the view of constructivism which views that people

produce knowledge and form meaning based on their experiences (Serevina et al., 2018). In using the inquiry model, students get the necessary instructions or it can be in the form of directing questions. So that students can work independently in solving these problems (Sesunan et al., 2021). The product (cognitive) in the form of knowledge or understanding of science is obtained based on direct experience. These experiences will become specific patterns that exist in science.

The scientific process is a set of skills used in studying natural phenomena so as to generate knowledge and develop that knowledge. Through these science process skills, students will behave like experts or scientists when they study science. These process skills include observing, experimenting, processing data and communicating (Özgelen, 2012). Measurement of mastery of the process dimensions through student observation sheets showed sufficient results. There was an increase in student activity during the learning process with an average score of 58.2%. This is inseparable from the syntax contained in the inquiry model. Students are faced with problems, the solutions to these problems are investigated and found by themselves according to their abilities. The teacher stimulates and encourages students to be able to ask their own questions, then gives students the opportunity to conduct investigations based on the questions made and find the answers themselves. In this process, the teacher guides students to be able to go through the stages that are adjusted to the lesson plan. The inquiry model has an effect on students' science process skills Mardaleni et al., (2019). This model can create effective learning and encourage students to experiment actively, independently, and cooperatively. Saying that the results of learning science through the scientific process leave a deep impression and are not easily forgotten by students (Kelana et al., 2020);(Sari et al., 2020). Thus, learning will be more meaningful for students' lives. The skills or competencies that have been obtained can also be used as the basis for solving problems encountered in everyday life.

Scientific attitude is the attitude that scientists have in seeking and developing new knowledge, such as being objective, careful, responsible, open-minded, always wanting to learn, and so on (Wildayanto & N, 2020);(Supardi et al., 2019). In the latest reference sources, scientific attitudes also cover their characteristics, including tentative, subjective, empirical, socio-cultural, limitations, scientific method (process), scientific method (attitude), law and theory, science and technology, creative. Scientific attitudes can be developed by learning that takes place in schools (Fitriani et al., 2020);(Kadmayana et al., 2021). The development of scientific attitudes cannot be taught through certain units of study, scientific attitudes can be developed through positive examples that must be continuously supported, fostered and developed so that they can be owned by students. In this study, the measurement of the dimensions of scientific attitude used a questionnaire instrument containing 10 properties of the nature of science, data analysis showed the average value on good criteria. The development of the nature of science is expected to make a major contribution to the improvement of the learning process that aims to achieve the objectives of science learning (Sutinah & Widodo, 2020). The process of learning science so far is still dominated by teachers so that it only touches the cognitive abilities of students (Sulistriani et al., 2021). The lack of innovation has an impact on the scientific attitude of students. By participating in learning using the inquiry model, students are expected to further develop their scientific attitude (Pamuji et al., 2019).

4. CONCLUSION

The ability of the nature of science and is something that is very important to be taught in elementary schools. This is because the nature of science is an element in the development of scientific literacy. To develop this ability, support from various parties is needed, especially from the teacher himself as a practitioner in the field. The results of the study indicate that the inquiry model can improve the ability of the nature of science and its nature in students in elementary schools. The components in the nature of science which include products, processes and attitudes and ten properties, show average results on good criteria. Therefore, teachers can use the inquiry model as an alternative in developing components and traits related to the nature of science. In future studies, it is hoped that they can develop other models/approaches/strategies/methods, in order to improve students' abilities towards the nature of science and its characteristics.

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Teacher's Perspective: Implementation of Online Learning during the Covid-19 Pandemic

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ABSTRAK

Pandemi Covid-19 menyebabkan terjadinya transformasi besar-besaran di berbagai bidang kehidupan. Salah satunya, terjadi transformasi pembelajaran tatap muka menjadi pembelajaran daring. Penelitian ini bertujuan untuk menganalisis proses pembelajaran dalam jaringan (daring), faktor-faktor pendukung serta faktor-faktor penghambat guru dalam melaksanakan pembelajaran daring di masa pandemi Covid-19. Penelitian ini menggunakan jenis penelitian metode deskriptif kualitatif. Subjek yang digunakan dalam penelitian ini adalah guru Kelas V sekolah dasar. Teknik pengumpulan data yang digunakan dalam penelitian ini berupa angket terbuka, wawancara semi terstruktur, dokumentasi dan catatan lapangan. Analisis data dilakukan secara kualitatif melalui proses reduksi dan verifikasi. Hasil dan pembahasan penelitian ini menunjukkan bahwa pembelajaran daring dirasakan kurang efektif bagi guru terutama untuk pembelajaran di jenjang sekolah dasar. Hal tersebut dikarenakan pembelajaran dilaksanakan secara daring membuat guru merasa kurang maksimal dalam memberikan materi pembelajaran sehingga menjadikan materi tidak tuntas. Selain itu, penggunaan media pembelajaran dalam pembelajaran daring juga dirasa tidak maksimal. Berdasarkan hasil penelitian tersebut, perlu diadakan studi lanjut untuk mengevaluasi pelaksanaan pembelajaran daring di sekolah dasar untuk memperoleh solusi yang tepat untuk menangani permasalahan yang terjadi.

ABSTRACT

The Covid-19 pandemic has caused a major transformation in various fields of life. One of them is the transformation of face-to-face learning into online learning. This study aims to analyze the online learning process and the supporting and inhibiting factors for teachers in carrying out online learning during the Covid-19 pandemic. This research uses a qualitative descriptive research method. The subjects used in this study were elementary school fifth-grade teachers. Data collection techniques used in this study were open questionnaires, semi-structured interviews, documentation, and field notes. Data analysis was carried out qualitatively through a reduction and verification process. The results and discussion of this study indicate that online learning is less effective for teachers, especially for learning at the elementary school level. This is because learning carried out online makes teachers feel less than optimal in providing learning material so that the material is incomplete. In addition, using learning media in online learning is also not optimal. Based on the results of this research, further studies need to be conducted to evaluate the implementation of online learning in elementary schools to obtain the right solution to deal with the problems that occur.

1. INTRODUCTION

Education must be carried out to prepare citizens with superior human resources (Fauzia & Kelana, 2021; Margunayasa et al., 2021). The specialization in online learning has increased, ensuring affordability in accessing education (Darmalaksana et al., 2020; R. D. P. Putri & Suyadi, 2021). Online learning is a learning activity that utilizes the internet network with flexibility, accessibility, connectivity, and capabilities to bring out various types of learning interactions (Dewantara & Nurgiansah, 2020; Rahma & Pujiastuti, 2021; Rigianti, 2020). Online learning or e-learning is defined as learning which involves the use of the internet with accessibility, connectivity, flexibility, and the ability to bring up various types of interactions in the process of implementing learning (Agustina et al., 2021; Harahap et al., 2021). At the elementary school level, learning is carried out "online" with the help of parents as mentors in the learning process at home (Sakti, 2021; Wulandari & Purwanta, 2021). The implementation of online learning is supported by online learning devices such as smartphones and computers/laptops with an adequate connection and is supported by several applications such as google classroom, video conference, telephone or live chat, zoom or Whatsapp groups. Of course, implementing this "online" learning system requires the competence of technologically literate teachers and parents' readiness to facilitate facilities and

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infrastructure to support the learning process (Saugi, 2020; Stoica & Roco, 2013). The role of parents in making their children happy in the learning process at home is very necessary. This supports the facilities and markets in carrying out online learning, such as the availability of Android-based device that supports the implementation of learning from itself and the availability of internet access data packages to support the running of online learning (Cheng & Szeto, 2016; Lau et al., 2020).

However, the reality in the field, online learning still cannot be implemented optimally due to the limited infrastructure supporting the learning system, the characteristics of diverse students, teacher contributions in implementing the online learning system, and various other factors (Asrul & Hardianto, 2020; Ritonga et al., 2020; Wijayanti & Fauziah, 2020a). Online learning is considered less effective for teachers, especially for children of primary school age, because learning is carried out online. Teachers are also not optimal in providing learning materials, so the learning subject is incomplete, and the use of learning media in online learning is considered not optimal (Knoop-van Campen et al., 2020; Saugi, 2020; Suarsi & Wibawa, 2021). In addition to the many complaints of parents regarding online learning, it turns out that learning also has several advantages (Ritonga et al., 2020). Some of the benefits of online learning are the flexibility of time and place of study. For example, learning can be done in the room, living room, and so on, as well as the time that is adjusted to be morning, afternoon, evening, or night (Putria et al., 2020; Rosyidiana, 2021). It can solve problems regarding distance. For example, students do not have to go to school first to study. There are no restrictions and can cover a large area. In addition to the advantages of online learning, online learning also has disadvantages. The advantage of online learning is that it builds a new learning atmosphere. Online learning will bring a new atmosphere for students who usually study in the classroom (Rosyidiana, 2021; Yunitasari & Hanifah, 2020).

The limitation of internet quota or internet or wifi packages that are a link in online learning and the interference of several other things. Online learning results in a lack of interaction between teachers and students and students themselves (Malyana, 2020; Mansyur, 2020). This lack of interaction can slow down the formation of values in the teaching and learning process. Online learning being carried out today is a new thing felt by teachers and students (Süt & Öznaçar, 2021; Zakaria et al., 2021). In addition, one of the obstacles experienced by teachers is the lack of teacher skills in operating digital products. As a result of which, online learning in the early days of the pandemic was mostly only filled with the assignment process because it is undeniable that with this online learning, teachers are required to quickly adapt to digital technology (Garbe et al., 2020; Pernantah et al., 2022). During the Covid-19 pandemic, teachers are required to be creative in presenting mathematics learning that is fun and easy to understand so that students can continue to learn productively even though the learning method is carried out online. The new atmosphere can increase students' enthusiasm for learning (Purwanto, 2020; Syachtiyani & Trisnawati, 2021). Some of the shortcomings that have become the nature of the learning process n online include the availability of facilities and infrastructure, mastery of technology that is still lacking, additional internet city costs, and additional work for parents in accompanying children. This problem occurs because not all parents have smartphones or laptops. Limited quota to get an internet or wifi network that functions as a link in receiving and collecting online learning information is an obstacle to the learning process. The atmosphere of the house that is not conducive makes students unable to focus on learning, especially the characteristics of elementary school students who are easily not focused on learning, as well as the readiness of parents to guide students in the learning process (Muhammad Fikri, Muhammad Zaki Ananda, 2021; Sumarno, 2020). Based on these problems, this study analyzes the online learning process, supporting factors, and factors inhibiting teachers from online learning during the Covid-19 pandemic.

2. METHOD

The type of research used in this study was a qualitative descriptive method. The results of qualitative research in the realm of education were descriptive. Qualitative research aims to understand individual views, find and explain processes, and explore in-depth information about limited research subjects or backgrounds (Sugiyono, 2019). The research subjects used in this study were all teachers of SD Class V, Jembrana District, for the 2021/2022 Academic Year. In selecting the research subjects, researchers used purposive sampling techniques. Purposive sampling was a sample determination technique with certain considerations. The selection of subjects was motivated because this study aimed to determine how the learning process was online and what factors supported and hindered teachers in the online learning process for elementary school teachers. The data collection methods used in this study were interviews, questionnaires or questionnaires, and documentation. The type of interview used in this study was in the form of semi-structured interviews. The type of questionnaire used in this study was an open questionnaire. An open questionnaire is a questionnaire that contains questions or statements that can be filled in freely

by respondents. A document is a record of an event that has passed. Documents can be in the form of writings, images, or monumental works of a person (Sugiyono, 2019).

The research procedure used in this study was divided into three stages: the pre-field stage, the fieldwork stage, and the data analysis stage. In the pre-field stage, the researcher compiled research design of an understanding of the methods and techniques in the research. Choosing a research field, exploring and assessing the field in field orientation form. The researchers tried to explore all elements of the social, physical, and natural environment. The field recognition was also intended to assess the situation, situation, background, and context. Checking whether there was suitability with the problem. Preparing research equipment needed or used in research, such as research permits, stationery, and other equipment in supporting research. At this stage of fieldwork, the researcher understands the research background first. Researchers must prepare themselves to research to obtain the data or information required for the research. The data came from questionnaires and interviews conducted with elementary school teachers at the designated research site. Researchers analyzed to get more in-depth results on the online learning process carried out by elementary school teachers during the COVID-19 pandemic and the supporting factors that hinder teachers in implementing online learning during the COVID-19 pandemic. After the data was obtained, researchers compile the data descriptively and in-depth so that the data that has been received can be adequately studied. In the data analysis stage, in qualitative research, the data comes from various data sources collected through various data collection techniques and is carried out continuously until the data is saturated. Data analysis carried out by researchers is to process data that has been collected and obtained while in the field in the form of information and documents in the previous stage, then compiled into a study.

3. RESULT AND DISCUSSION

Result

Based on the results of research with qualitative descriptive methods through data collection techniques in the form of questionnaires and interviews that have been conducted on class V teachers of Jembrana District, about the online learning process and the factors hindering teachers during online learning during the COVID-19 pandemic, it can be concluded that the COVID-19 pandemic has greatly impacted the world of education. This pandemic has resulted in the learning process being significantly disrupted, the learning process, which was usually carried out face-to-face between teachers and students in the classroom during the learning pandemic, has turned into online learning. The teacher revealed that online learning still has many obstacles for elementary school children. The participation of students in learning also does not reach 100% in online learning. Some students did not even follow the learning from beginning to end, so the teacher felt confused in the assessment process of these students. The online learning process was carried out following previously determined learning hours. Based on the study results obtained from open questionnaires and semi-structural interviews conducted online. The questionnaire was distributed online through a google form, while the interview was conducted using WhatsApp.

The questionnaire was distributed to all class V teachers of the Jembrana District. The questionnaire used in this study was an open questionnaire, where the open questionnaire was a questionnaire whose answers were filled in by respondents. This questionnaire aimed to obtain information in the implementation of the learning process online during the COVID-19 pandemic as well as supporting factors and obstacles for teachers in carrying out the learning process online during the COVID-19 pandemic at SDN Kec. Jembrana. During the COVID-19 pandemic, class V teachers at SDN 4 Pendem implemented an online learning process. The procedure for implementing the online learning process that has been carried out was that students were directed to watch TV (TVRI) according to the direction of the Ministry of Education and Culture.

Furthermore, students fill in or answer questions given by broadcast TV (TVRI) then students report to their class guardians. The teacher expects that even if the students do the questions at home, the students still do well. The teacher explained that the factors supporting teachers in learning activities during the COVID-19 pandemic are computers, cellphones, TVs, and internet quotas. With these facilities, teachers can carry out online learning activities. The actors who hindered teachers in learning to teach during the COVID-1 9 pandemic were; first, some students did not have cellphones to facilitate them while studying. Second, parents of students who were too busy at work. Parents of students who are too busy working become obstacles when teachers were about to conduct online learning. Parents cannot accompany their children while studying online, so the student had to postpone his attendance while studying online. Third was the limited quota. Limited quotas were also an obstacle to online teaching and learning activities. Sometimes parents complain directly to the teacher regarding the number of quotas that must be prepared

when the teaching and learning activities are conducted online. If there are students who do not have a quota, those students cannot participate in online learning activities.

The interviews used in this study were a type of semi-structured interview with two primary respondents, namely class V teachers of SDN 4 Pendem and class V teachers of SDN 3 Pendem. The interview was conducted to deepen the data obtained from the questionnaire. The results of the interviews with two respondents were due to the pandemic when teachers apply online learning. Procedures were carried out face-to-face through video calls or voice notes in some learning materials, such as science learning. This was done because the teacher does not only write down the learning material recorded or through writing, so the teacher uses video calls or voice notes. In addition, Whatsapp was a medium of liaison between teachers and students. Through the WhatsApp group, teachers can give assignments and collect assignments that students have done. Assignments were also sometimes not following important learning materials. Some tasks were given to students. The gift was also not composed, sometimes repeating the teacher's material. When online learning, students only repeat so they don't have to give a lot of explanatory material. When there was an order to study online the next day, it was hoped that the delivered learning material had been completed. This had become a habit. Two months before there is an exam, the material must be completed so that the next two months, the teacher and students stay repeat and strengthen the material for the final exam material so that teacher does not pursue the learning material.

During this online learning process, all tasks that were done must be written in the same book. Learning was also carried out according to the lesson schedule the teacher had prepared for teachers in teaching and learning activities during the corvid-19 pandemic at SDN 3 Pendem. First, there must be credit and a full quota. The existence of credit and quota will facilitate online learning activities to be carried out between teachers and students. Second, there are cell phones for learning facilities. So a beneficial tool for cellphones and internet connections for online learning. Factors that hindered teachers' teaching and learning activities during the COVID-19 pandemic were the limitation of students having cellphones or not all students having cellphones. This makes for delays in delivering the material to students. Second, students who were lazy even though they had their own cellphone or did not comply with the established rules, for example, the teacher gives a task from 08.30 suddenly the student sends or collects the task did not know what time sometimes until the evening or passes the deadline for the collection that has been determined. Then the third factor was the material that was not completed when online learning was carried out. Unlike the case with learning carried out directly, for example, giving assignments at the time of learning, students only dwell on one task, not moving to the next task. This makes it difficult for the teacher to move to the next learning material because everything had not been completed.

Discussion

Based on the results of research with a qualitative descriptive method through data collection techniques in the form of questionnaires and interviews that have been conducted on class V teachers of Jembrana District, about the learning process in the network (online) and the factors hindering teachers during the implementation of online learning during the COVID-19 pandemic. This pandemic has resulted in the learning process being greatly disrupted the learning process, which was usually carried out face-to-face between teachers and students in the classroom during the learning pandemic has turned into online learning. The teacher revealed that online learning still has many obstacles for elementary school children. The participation of students in learning also does not reach 100% in online learning. Some students did not even follow the learning at all from beginning to end, so the teacher felt confused in the assessment process of these students. The online learning process was carried out following previously determined learning hours. Online learning is carried out by teachers using Whatsapp as a medium for teachers to deliver material or send assignments to students. Online learning can use digital technology, but what must be done was the provision of assignments through monitoring mentoring by teachers through WhatsApp groups so that children learn. Teachers must also coordinate with parents through video calls or photos of children's learning activities at home to ensure interaction between teachers and parents. The teacher also makes video calls for some learning materials that require direct explanation. In addition, in terms of giving assignments given, sometimes it was not by the material that should be. It was because online learning causes teachers to find it difficult to move from one material to the next, but teachers strive to give assignments according to the handbook of students and teachers.

The development of covid-19 cases that are still high in Indonesia has encouraged the government to take anticipatory steps in the field of education, including limiting student learning to meet face to face in person (Latifah & Supena, 2021; Ritonga et al., 2020; Wijayanti & Fauziah, 2020b). Therefore, the government offers the concept of Distance Learning (PJJ) with an online system. Distance learning is a learning system that does not take place in one room, and there is no face-to-face interaction between teachers and learners (Firman & Rahayu, 2020; Muhammad Fikri, Muhammad Zaki Ananda, 2021;

Prawiyogi, Anggi Giri, 2020). PJJ is learning using a medium that allows interaction between teachers and students who do not directly meet face to face (N. A. Putri et al., 2021; Ritonga et al., 2020). Online learning, in its application, is very dependent on the internet connection and the availability of online-based media as a means of learning. However, learning designs implemented online must still pay attention to the competencies expected to be mastered by students, considering that learning has a very complex nature because it involves pedagogical, psychological, and didactic aspects simultaneously.

Online learning has an impact on students, the impact experienced by students was that they feel very saturated and bored with learning. The enthusiasm and enthusiasm shown by students were decreasing day by day. This condition differs from when students study in class with their friends. Another reason for the COVID-19 pandemic for students was that schools were closed for too long to make children bored. The children begin to get bored at home and want to go to school immediately to play with their friends. Students are used to being in the process of interacting with their friends, play and joking with their friends and joke. Face-to-face with his teachers. The teacher also assesses that the student's sense of responsibility is seen if he can take part in learning and fill out the online learning attendance list (Lau et al., 2020; Mpungose, 2021). Students often complain because they were only given continuous tasks, when in fact, the teacher feels uncomfortable because they cannot provide learning materials directly to scale participants and only give assignments. The way to overcome this feeling of saturation is for teachers to take the initiative to provide interesting learning media such as videos. Still, most online learning teachers also experience obstacles or limitations in using learning media.

The teacher's assessment process also has the same system as the usual learning grading system. Teachers' assessments in online learning grades were also given when learners collect their assignments, and all subjects also have the same assessment. Online learning for elementary school children is considered less effective. If it is concentrated, the effectiveness is only around 70%. Online learning can be carried out because of several supporting factors, including cellphones, credit, quotas, and a stable and good internet network (Mpungose, 2021; Önal et al., 2017; Widoretno & Dwiastuti, 2019). Mobile phones are the main supporting factor in online learning because, without a cellphone, online learning will not be carried out (Fitriani, 2020; Windhiyana, 2020). This facility is very important for the smooth teaching and learning process, such as laptops, computers or cellphones, making it easier for teachers to provide online teaching and learning materials (Asrul & Hardianto, 2020; Kim, 2011). Teachers take advantage of supporting factors in online learning is to maximize their use by looking for learning media in the form of videos and continuing to follow the development or progress of students in following online learning reported by parents through the WhatsApp group.

In addition, the teacher also provides information or things that students in learning ask. In addition to the supporting factors in implementing online learning, several inhibiting factors exist in online learning. This happens because online learning is something new for teachers. With the remote learning method, teachers need time to adapt, and they face new changes that will indirectly affect the quality of learning outcomes (Ong et al., 2022; Tang et al., 2021; Wibawa et al., 2018). These inhibiting factors include that not all students have cell phones. The next factor is laziness in students when doing assignments, even though it has been supported by facilities that support learning. The next factor was that many parents still work, so they cannot fully guide students in learning. There were several ways to overcome these obstacles, including providing information at the beginning before learning was carried out so that at the time of learning, everything was ready to follow the learning. Next was to collaborate with the class committee regarding students who do not have cellphones to be able to ask friends whose homes are close so that they can both participate in learning. In addition, teachers provide easing in the collection of tasks for parents who are busy working. Online learning is also inseparable from the role of parents of students because it considers the age of elementary school children who still need guidance and insight into learning (Brom et al., 2018; Paul & Singh, 2020). Parents always provide new information about their children's development in online learning (Daheri et al., 2020; Yulianingsih et al., 2020). In online learning, motivation from teachers is needed by students to remain enthusiastic about participating in learning. Teachers provide motivation by giving interesting and fun assignments, and all teachers make a video (Yulianingsih et al., 2020).

Based on the discussion of the COVID-19 pandemic, it significantly impacts the world of education, especially in the learning process carried out by teachers. The learning process carried out by teachers has changed, usually carried out directly in online learning. Online learning was considered less effective for teachers, especially for elementary school-aged children, because learning was carried out online. Teachers also do not feel optimal in providing learning materials, so the material was incomplete, and the use of learning media in online learning is also considered not optimal. In its implementation, online learning requires facilities that support the effective implementation of these learners. This study implied that it was hoped that the performance of learning during the Covid-19 pandemic can still be carried out even though there are still things that need to be refined to hinder the learning process.

4. CONCLUSION

The COVID-19 pandemic has significantly impacted education, especially in the learning process carried out by teachers. The teacher's perception of the impact that is felt on students is the availability of inadequate facilities and infrastructure and differences in atmosphere when studying in class with studying at home, affecting student motivation. And the tendency of online learning styles was visual and written. Teachers and students feel the burden on internet quotas, especially if they are in an area disturbed by signals, monitoring children's development are limited, and teachers feel that they are not as free as in class. In the future, it is necessary to evaluate the implementation of online learning so that it provides maximum results.

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The Effectiveness of Online Learning Through Google Classroom to Improve the Learning Achievement

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ABSTRAK

Di masa pandemi COVID-19, aplikasi populer yang digunakan dosen adalah aplikasi yang disediakan oleh pihak kampus serta aplikasi pihak ketiga seperti Whatsapp, Google Classroom, atau Webex. Penggunaan aplikasi Google Classroom memiliki beberapa kelemahan antara lain hanya dapat diakses oleh akun google dan tidak adanya pemberitahuan bahwa materi yang disampaikan telah dibaca secara lengkap oleh siswa sehingga efektivitas Google Classroom masih diragukan. Penelitian ini bertujuan untuk menganalisis efektivitas pembelajaran online melalui google classroom untuk meningkatkan prestasi belajar kewirausahaan siswa kelas V SD Negeri. Jenis penelitian ini adalah penelitian kuantitatif dengan analisis data deskriptif kuantitatif. Populasi penelitian ini adalah 70 siswa SD Negeri. Teknik pengumpulan data yang digunakan adalah kuesioner. Teknik pengujian hipotesis menggunakan analisis linier sederhana, linieritas regresi dan koefisien determinasi. Hasil penelitian menunjukkan bahwa pembelajaran online melalui google classroom efektif dalam meningkatkan prestasi belajar kewirausahaan siswa kelas V SD Negeri tahun Pelajaran 2020/2021. Artinya diketahui 60 % pembelajaran online melalui google classroom efektif untuk meningkatkan prestasi belajar kewirausahaan, sedangkan 40% sisanya pembelajaran online melalui google classroom tidak efektif dari faktor lain yang tidak diteliti dalam penelitian ini.

ABSTRACT

During the COVID-19 pandemic, popular applications used by lecturers were applications provided by the campus as well as third-party applications such as Whatsapp, Google Classroom, or Webex. The use of the Google Classroom application has several weaknesses, among others, it can only be accessed by a Google account and there is no notification that the material submitted has been read in full by students so that the effectiveness of Google Classroom is still in doubt. This study aims to analyze the effectiveness of online learning through Google Classroom to improve achievement. learning entrepreneurship for fifth grade elementary school students. This type of research is quantitative research with quantitative descriptive data analysis. The population of this research is 70 students of public elementary school. The data collection technique used is a questionnaire. The hypothesis testing technique uses simple linear analysis, regression linearity and the coefficient of determination. The results showed that online learning through google classroom was effective in improving the entrepreneurship learning achievement of fifth grade elementary school students. This means that it is known that 60% of online learning through google classroom is effective for improving entrepreneurial learning achievement, while the remaining 40% of online learning through google classroom is not effective from other factors not examined in this study.

1. INTRODUCTION

Education is a character formation carried out by a person to improve his standard of living towards a better one. So it can be said that education is very important for a person to be able to build a more positive self-character (Njui, 2017; Rusilowati & Wahyudi, 2020). Through education a person can build a better self-character, broad insight, good attitudes and behavior, personality, intelligence and have good religious character (Dewantara et al., 2021; Farozin et al., 2020). The National Education System which states that good education is a conscious and planned effort in realizing learning and the learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, noble character and skills needed by themselves, society, nation and country (Gaol & Sitepu, 2020; Rusilowati & Wahyudi, 2020). The purpose of education is to develop oneself to become a human being who is faithful, pious, has noble character, healthy, knowledgeable, capable, creative and become independent and responsible human beings both at school and in the community (Martono, 2019). Educational goals can be achieved if teaching and learning activities can be carried out properly (Kurniawan et al., 2019; Urh et al., 2015). Where teachers and students must be able to work together to obtain a good

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learning process. In carrying out its activities, it must be in accordance with the expected goals so that it will create effective learning (Widodo & Al Muchtar, 2020).

Based on the current Covid-19 situation minister of Education and Culture of the Republic of Indonesia regarding circular letter No. 4 of 2020 regarding the implementation of education policies in the emergency period of the spread of the virus disease *(Covid-19).* This situation forces teachers to adapt in using technology media in providing distance learning (Coman et al., 2020; Suryaman et al., 2020). The most common devive used are cellphones and laptops/computers that are connected to the cellular network. Applications that can be used in online learning include *Google Classroom, Zoom, Google Meet , and WhatsApp* messaging applications and so on (Aswir et al., 2021; Setiadi et al., 2021). The material provided is in the form of PPT *files, videos and reading materials.* There are so many learning media that use online learning systems. Therefore the teacher must be able to choose which media is really suitable to be applied to students in the learning process in order to provide meaningful learning process (Azlan et al., 2020).

Based on the problems that have been described, there are previous research that relevant to the problem, such as research conducted with the title "Effectiveness of Biology Learning During the Pandemic Covid-19 Madrasah Aliyah Negeri 1 Medan" (Siahaan et al., 2021). Online learning is learning where between students (students) and teachers (teachers/lecturers) are not in one place at the same time. In this kind of learning, the use of media greatly determines the learning outcomes. The other research study conducted by previous research with the title "Study of the Effect of Online *E-Learning* on Grade IV Mathematics Learning Outcomes" (Sulistyaningsih et al., 2018). Online learning means that students are subjects in the learning process. Students have the basic ability to develop optimally according to their abilities. The teacher only acts as a facilitator and guide for students to provide stimuli that can challenge students to feel involved in the learning process. The data collection in this research is carried out online. The data collection that will be carried out in this study is different from previous research which distributed questionnaires directly, this is what makes the research unique (Budiman et al., 2020; Lobe et al., 2020).

Online learning has become a necessity in the world of education in the midst of the Covid-19 pandemic. With this increasing popularity, students' perceptions of implementing online learning have become a top priority for their education. Learning media is a form of tool that functions as a distributor of information. Media in the learning process is very important to use because it will produce effective learning. Learning media is a tool in the learning process to produce an effective and able to stimulate the minds and skills of students in accordance with learning objectives. The challenge faced in online learning is choosing the best application that can increase student achievement. One of the most possible and widely used online learning media is *Google Classroom*. Therefore, authors are interested in conducting research with the title "Effectiveness of Online Learning Through *Google Classroom* To Improve Social Studies Learning Achievement for Class V Students at SD Negeri in Pematang Raya Academic Year 2020/2021". The purpose of this study was to measure the effectiveness of the learning process using Google classroom on learning achievement.

2. METHOD

This method as a scientific method is concrete/empirical, objective, measurable, rational and systematic. This method is also called the *discovery method* (Anderson et al., 2016; Zhang et al., 2019). This method allows finding and developing the latest science and technology. So in this study the researcher did not conduct the comparison of variables to other samples, and looked for the relationship between these variables with other variables. This research is called quantitative descriptive research method. Research Location conducted in SD Negeri Pematang Raya with total Population 70 people and sample research 70 people. The researcher will take a total sample of 70 people, because the sample used is less than 100 people. This research instrument was carried out by collecting data through a questionnaire via *Google Form* (Mawarni et al., 2020). To obtain data and an actual picture of the topic of this research, the authors used instrument testing, namely validity and reliability tests. Data analysis techniques in study this consist from assumption test classic , and testing hypothesis (Vaismoradi et al., 2016). The quantitative descriptive method is divided into several stages, as shown in Figure 1. Then grid of online learning variable questionnaire through *Google Classroom and* Learning Achievement is shown in Table 1.

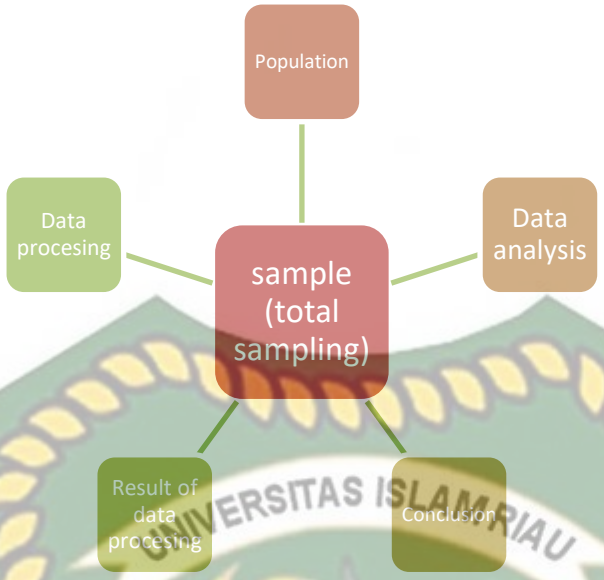

Figure 1. Stages of quantitative descriptive method (Sugiyono, 2016)

Table 1. Grid of Online Learning Variable Questionnaire through *Google Classroom and* Learning Achievement

No	Aspect asked	indicator	No. Items/questions	Number of questions
1	Online Learning Through *Google Classroom*	1. variety of learning resources 2. variety of learning methods 3. nurturing or mentoring 4. assessment variation 5. Integration and combination of other platforms	1-3 4-6 7-9 10-12 13-15	15 questions
2.	Learning Achievement Number of Questions	cognitive, affective, and psychomotor	1-15	15 questions 30 questions

3. RESULT AND DISCUSSION

Result

Questionnaire Validity Test

Before the instrument is used as a data collection tool, the instrument must be tested first. So that the instrument gets a valid (legitimate) and reliable (trusted) instrument. However, before testing the instrument, the researcher must determine that the research sample is taken from class V Negeri in Pematang Raya, which is 15 people. This is intended so that instrument trials can be carried out on the research population outside the research sample. The type of instrument used is a questionnaire in the form of a statement with a total of 20 statements on variable X, namely online learning through Google *Classroom* . Each instrument has five (5) alternative answers, namely: Strongly agree, Agree, Somewhat, Disagree, Strongly disagree. Questionnaires distributed at the time of instrument testing to students of class V SD Negeri in Pematang Raya. This test is done by calculating r_{hitung} using the Pearson Product Moment formula and then comparing with r_{tabel}. If $r_{hitung} > r_{tabel}$ then the data collection tool is valid to be used in measuring the variable, it is better if $r_{hitung} < r_{tabel}$ then the data collection tool is invalid and not suitable for use in measuring the variable. The researcher's validity test used a significant level of 5%. The value for N=15 at the 5% significance level is 0.514. The results of the validity test of the readiness variable instrument were calculated manually and using excel as shown in Table 2.

Table 2. Results of the Validity Test of Online Learning Variables through Google Classroom

Items to	r-count	r-table	To the conclusion
1	0.6842789	0.514	Valid
2	0.5998607	0.514	Valid
3	0.7294696	0.514	Valid
4	0.7854851	0,514	Valid
5	0.6266713	0,514	Valid
6	0.5681656	0,514	Valid
7	0.6349472	0,514	Valid
8	0.662926	0,514	Valid
9	0.5334295	0,514	Valid
10	0.5350954	0,514	Valid
11	0.6397558	0,514	Valid
12	0.6150331	0,514	Valid
13	0.6262134	0,514	Valid
14	0.793716	0,514	Valid
15	0.7780299	0,514	Valid
16	0.7107152	0,514	Valid
17	0.6770068	0,514	Valid
18	0.7065922	0,514	Valid
19	0.6682273	0,514	Valid
20	0.6262134	0.514	Valid

Based on the Table 2 it can be concluded that each r_{hitung} of each item is > from 0.514 (r_{tabel}) and the significant value of each item is <0.05. So every question contained in the online learning questionnaire through *Google Classroom* used in this study is valid.

Questionnaire Reliability Test

Based on questionnaire reliability test obtained r_{count}= 0.922 and r_{table}= 0.514. Then r_{count}> r_{table} and *Cronbach Alpha* (0.922) > 0.60. From the results of the calculation of the reliability test of online learning through *google* classroom , it can be concluded that the instrument in the research questionnaire used is reliable.

Description of Research Data

This research was conducted in the fifth grade of SD Negeri in Pematang Raya . The data from this study consisted of one independent variable and one dependent variable. The independent variable is online learning through *google classroom* and the dependent variable is learning achievement. In order to describe and test the relationship between the independent and dependent variables in this study, this section presents a data description of each variable based on the data obtained. Descriptive quantitative analysis where this approach is taken because the research process can be carried out in a structured manner and uses a large number of research samples. This analysis suggests respondent data such as respondent characteristics. Based on data on student achievement in social studies subjects obtained through tests carried out by fifth grade students at SD Negeri in Pematang Raya for the 2020/2021 academic year. Respondents taken for this study amounted to 70 special students for class V ^{1} and V ^{2} in SD Negeri Pematang Raya. The descriptive results of Research Data are shown in Table 4.

Table 3. Descriptive Results of Research Data

Descriptive Statistics							
	N	Range	Minimum	Maximum	mean		Std. Deviation
	Statistics	Statistics	Statistics	Statistics	Statistics	Std. Error	Statistics
Online Learning Through Google Classroom	70	30	59	89	73.13	0.614	5.136
Learning achievement	70	30	70	100	89.00	0.725	6.065
Valid N (listwise)	70						

Based on Table 3, identification of the tendency or high and low learning achievement of students in entrepreneurship subjects in this study from the test test scores obtained by fifth grade students of SD Negeri in Pematang Raya for the 2020/2021 Academic Year. In accordance with the data above, it can be obtained that all students get a score of 70, so all students have a complete social studies subject value.

Classic Assumption Test Results

Data Normality Test

The normality test was conducted to determine whether the research data to be analyzed was normally distributed or not. This test was carried out using the *Kolmogorov-Smirnov test* with a significant level of 0.05 provided that if $D_{max} < D\ \alpha$then the data was normally distributed. The normality test results are shown in Table 4.

Tabel 4. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
N		70
Normal Parameters	Mean	0.0000000
	Std. Deviation	7.90794082
Most Extreme Differences	Absolute	0.135
	Positive	0.135
	Negative	0.122
Kolmogorov-Smirnov Z		1.129
Asymp. Sig. (2-tailed)		0.156

Based on the Table 4, the Asytotic Significance is 0.156. The value of 0.156 > from 0.05, it can be concluded that the online learning variables through *google classroom* and learning achievement are normally distributed.

Hypothesis Test Results

Simple Regression Test

Table 5. Simple Linear Regression Test Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	72.845	14,149		5.148	0.000
	Online Learning Through Google Classroom	0.200	0.190	0.126	1.051	0.297

Base on Table 5, it is known that the constant (a) value is 72.845, while the value of online learning through google classroom (b/ regression coefficient) is 0.200, so the regression equation can be translated: The constant of 72.845 means that the consistent value of the learning achievement variable are 72.845. The regression coefficient of the online learning variable through *google classroom* is 0.200 which states that for every 1% addition of the value of online learning through *google classroom*, the learning achievement value increases by 0.200

Linearity Test

The function of the regression linearity test is to determine the form of the relationship between the independent variable and the dependent variable. The meaning of linear is like a straight line relationship. Linearity test results are shown in Table 6.

Table 6. Linearity Test Results

Statistics			Sum of Squares	df	Mean Square	F	Sig.
Achievement Learning * Online Learning	Between Groups	(Combined)	984,523	20	49,226	0.709	0.797
		Linearity	70,134	1	70,134	1.011	0.320
		Deviation from Linearity	914,389	19	48.126	0.693	0.807

Statistics		Sum of Squares	df	Mean Square	F	Sig.
Through Google Classroom	Within Groups	3400,563	49	69,399		
	Total	4385.086	69			

Base on Table 6, the results of the linearity test are known to be *Sig. Deviation from linearity* is 0.807>0.05, it can be concluded that there is a linear relationship between Online Learning through *Google Classroom* and Learning Achievement. Based on the results of the linearity test, it is known that the value F_{hitung}= 0.693 < F_{tabel} = 2.23. So, it can be concluded that there is a linear relationship between Online Learning Through *Google Classroom* and Learning Achievement.

Coefficient of Determination Test (r^2)

The basic concept of the coefficient of determination (R^2) aims to measure how far the model's ability to explain the dependent variables is. The coefficient values ranged between zero and one. A value close to sati means that the independent variable (X) provides almost all the information needed to predict the dependent variables (Y). Determination test results show that the *output* is obtained the value of R *Square* (coefficient of determination) is 0.600 or 60%, which means Online Learning Through Google Classroom is Effective for Improving Social Studies Learning Achievement for Class V Students SD Negeri in Pematang Raya for the 2020/2021 Academic Year. And the remaining 40% is influenced by other variables not included in this study.

Discussion

This study describes the effectiveness of online learning through Google Classroom to improve the social studies learning achievement of fifth grade students SD Negeri 091316 Pematang Raya for the 2020/2021 Academic Year. Online learning through Google Classroom is obtained from instruments in the form of questionnaires distributed online through *Google forms* with good quality because they are valid and reliable. Meanwhile, students' social studies learning achievement is obtained from the test questions that will be done by students. The results of the classical assumption test are the main requirements to be able to proceed to a simple linear regression test with data that are normally distributed and a significant level of > 0.05%. On the online learning variable through google classroom and learning achievement, the data has a normal distribution between variables with a significance level of 0.156 > 0.05. Effectiveness of online learning through *google classroom* to improve learning achievement can be seen in Table 4 which shows that f_{hitung}= 0.693 < f_{tabel}= 2.23. So from these results it can be said that Ho is rejected and Ha is accepted. So it can be concluded that online learning through google classroom is effective in improving social studies learning achievement of fifth graders at SD Negeri in Pematang Raya for the 2020/2021 academic year. From the results of the determination coefficient test (r^2) of 0.60, it means that 60% is known that online learning through google classroom is effective for improving social studies learning achievement , while the remaining 40% online learning through google classroom is not effective for improving social studies learning achievement.

For attendance and essay assignments, it seems that there are obstacles, but they are not too high compared to the three items. Attendance constraints, because the time to take attendance in Google Classroom is too short, causing students to be late absent so they are considered absent, this will certainly affect the student's score on the attendance assessment item (Lima & Isotani, 2021). For essay assignments, too many questions are given, causing students to sometimes need time to work on them and when they want to submit coursework on Google Forms there is a signal disturbance that in the end the assignment cannot be submitted again because the time allotted has run out. So that they certainly do not get a score on the assignment assessment item because they are considered not to have submitted assignments (Isotani & Te-, 2022; Sindi et al., 2021).

It is in line with previous research that describe students assessing mathematics learning using online media as very effective by 23.3%, most of them assessing it as effective (46.7%) and assessing it as average (20%) (Papadakis et al., 2018; Pratama & Retnawati, 2018). Although there are also students who consider online learning to be ineffective (10%) and absolutely none (0%) who consider it very ineffective. It is also supported by Research that state from a previous concluded that online learning will be effective if it applies Laurillard's essential components which include discursive, adaptive, interactive, and reflective aspects (Heggart & Yoo, 2018; Prestiadi et al., 2020; Silalahi & Hutauruk, 2020; Suryaman et al., 2020). However, 76.07% choose a combination of online learning is very important so that innovation in the form of integration with the environment refers to the digital learning component that can accommodate learning styles, flexibility, and learning experiences of students so that it can create positive feelings.

Effective learning is learning which in the process must involve students or students actively, so that learning objectives are achieved properly. Each class created by an educator will get a separate folder in Google products that makes it easier for educators to manage it (Gorghiu et al., 2015; Saputra et al., 2019). Educators can post news or announcements that can be commented on by students directly through virtual classrooms, this makes it easier for two-way interactions between educators and college student (Igwe et al., 2021; Zainuddin & Perera, 2018).

With this research, it is hoped that it can contribute to students, especially students at SD Negeri in Pematang Raya that online learning through Google Classroom has a very important role in achieving learning achievement, especially social studies learning achievement. Therefore, this research is expected to increase the use of online learning through Google Classroom for the better to achieve better learning achievement by trained/encouraged to create students who have good grades in achieving student achievement. Because there are several things that cause Online Learning through Google Classroom to be ineffective, one of which is where students often go in and out of Google Classroom. And some students do not join google classroom. So it is hoped that learning is also carried out through google meet or whatsapp groups, giving assignments or materials briefly and clearly, giving assignments according to the lesson schedule, and giving assignments that must be included with how it works. The results of this study can be used by other researchers who conduct further research.

4. CONCLUSION

Current conditions make teachers as a medium for delivering knowledge able to use facilities, media, and facilities that can support learning and innovate with the media to increase student interest in the midst of this epidemic to keep the spirit of learning at home. Various studies have been developed to be able to provide motivation and innovation to teachers who can use media that have been tested by researchers to be used as online learning tools. Based on the analysis of the discussion above. In accordance with the results of the research that the author did, the writer concluded that the online learning variables through google classroom and learning achievement were normally distributed. Online learning through Google Classroom is very effective in improving social studies learning achievement for fifth grade students.

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The Impact of Problem-Based Learning Model Assisted by Mentimeter Media in Science Learning on Students' Critical Thinking and Collaboration Skills

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ABSTRAK

Penelitian ini dilatarbelakangi oleh kemampuan mahasiswa yang masih kurang dalam mengidentifikasi, memahami, menyatakan, mencari solusi, dan menarik kesimpulan terhadap masalah yang diberikan. Selain itu mahasiswa juga cenderung pasif dalam pembelajaran. Penelitian ini bertujuan menganalisis pengaruh model pembelajaran problem-based learning (PBL) berbantuan media mentimeter terhadap kemampuan berpikir kritis dan kemampuan kolaborasi mahasiswa Pendidikan guru sekolah dasar. Metode yang digunakan dalam penelitian ini adalah eksperimen kuasi dengan desain non-equivalent control group. Kemampuan berpikir kritis dikumpulkan dengan tes kemampuan berpikir kritis berbentuk tes essay dan lembar observasi untuk mengetahui keterampilan kolaborasi. Hasil penelitian menunjukkan bahwa terdapat perbedaan yang signifikan kemampuan berpikir kritis dan keterampilan kolaborasi antara mahasiswa yang belajar dengan menggunakan problem based learning berbantuan media mentimeter dengan mahasiswa yang belajar tanpa menggunakan problem based learning berbantuan media mentimeter sehingga dapat disimpulkan bahwa model pembelajaran problem based learning berbantuan media mentimeter memberikan pengaruh pada kemampuan berpikir kritis dan keterampilan kolaborasi mahasiswa pendidikan guru sekolah dasar.

ABSTRACT

This research is motivated by the ability of students who are still lacking to identify, understand, state, find solutions, and draw conclusions to the problems. In addition, students also tend to be passive in learning. This study aims to analyze the effect of the problem-based learning model with the aid of the mentometer on elementary school teacher education students' critical thinking and collaboration skills. The method used in this study is a quasi-experimental design with a non-equivalent control group. Critical thinking skills were collected with critical thinking skills tests in the form of essay tests and observation sheets to determine collaboration skills. The results show significant differences in critical thinking and collaboration skills between students who study using problem-based learning with the aid of a mentimeter and students who learn without using problem-based learning with the aid of a mentimeter. So, it can be concluded that the problem-based learning model assisted by a mentimeter influences elementary school teacher education students' critical thinking and collaboration skills.

1. INTRODUCTION

The main aspect that makes a country developed or not can be seen in the quality of education in that country. Education is the nation's backbone (Rahayu et al., 2018; Utomo et al., 2020). Education is the key to all quality progress and development because with education; humans can realize all their potential both as themselves and as a community (Kurniawan, 2013; Sotero et al., 2020). Education is a guiding effort consciously by educators (including parents) towards students to develop students potential to form a perfect personality (Kuswari et al., 2019). Education functions to develop capabilities and shape the character and civilization of a dignified nation to educate the nation's life (Asyari et al., 2016; Utomo et al., 2020). The learning process at school is one of the educational processes. The learning process is not only limited to conveying knowledge from educators to students (teacher-centered), but students are required to be active in seeking, processing, and constructing knowledge so that learning can be centered on students (Aufa et al., 2020) through various learning experiences and interactions in multiple contexts (de Jong et al., 2021).

Student-centered learning is focused on students' needs, abilities, interests, and learning styles, with the teacher as a learning facilitator (Ariani, 2020; Ariyani & Prasetyo, 2021; Larasati, 2018). One of the teacher's roles is to guide learning practices to develop students' critical thinking skills (Cai, 2021; Reichert

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et al., 2021). Critical thinking skills are one of the life skills that students must have; having critical thinking skills will help students to solve simple or complex problems because considering the importance of critical thinking in educational discourse (Dewi et al., 2019; Giacomazzi et al., 2022). Critical thinking is a process in which a person elaborates on evidence-based statements and focuses on argumentation and reasoning (Landa-Blanco & Cortés-Ramos, 2021; Meirbekov et al., 2022; Sinaga et al., 2022). Critical thinking skills reflect a tendency to be open to new ideas, evaluate them critically, and be prepared to change one's point of view based on evidence (Alvarez-Huerta et al., 2022; Ellerton, 2022). The purpose of teaching critical thinking is so that students can apply it in various contexts, not only in the context in which they are taught but also in everyday life (Rombout et al., 2022). With the ability to think critically, students can consider the opinions of others and can express their own opinions. In addition to critical thinking, collaboration is also needed by students to be able to participate and compete in the 21st century. Collaboration skills unite views by discussing and exchanging opinions (Kereluik et al., 2013). Students' collaboration skills must be developed during science learning because students are also required to be able to collaborate with team members in solving problems (Ashraf et al., 2017).

However, in reality, science learning in schools tends to emphasize cognitive rather than affective and psychomotor abilities, so students only focus on developing cognitive abilities (Mardiana, 2018). Many think that science lessons are difficult to understand. The critical thinking ability of students is still low. Learning is still teacher-centered (Cahyono, 2017; Farisi et al., 2017). The teacher only uses a monotonous learning method. It causes a lack of student participation in learning (Ögren et al., 2017). Based on the results of observations and interviews with lecturers in the science concept 1 course, it is known that most of the second-semester student learning outcomes of the elementary school teacher education program at PGRI Yogyakarta University are still low. It can be proven from the results of assignments, mid-semester exams, and end-semester exams that they have not reached the achievement standards set by the university. Science 1 course is one of the courses that contains many concepts that students must master, so this course is still considered a collection of images that most students must memorize. As a result, they feel bored and pay less attention to the lecturer's explanations. Students' attention to lecture material only occurs at the beginning of learning. Students tend to be silent and do not ask questions even though they have been allowed to ask. In addition, information was obtained that the ability of students to identify, understand, state problems in a simple form, find solutions to given problems, and draw conclusions is still very low. Furthermore, the level of collaboration possessed by students is still relatively low, as in group discussions, some students rely on students who are active and more silent. As a result, learning is more dominated by active students. These problems, if not addressed, will negatively impact student learning outcomes.

One way that can be applied to overcome these problems is by using a problem-based learning model. The problem-based learning model can be applied in the learning process to develop students' cognitive, affective and psychomotor abilities (Asyari et al., 2016; Marzuki, 2017; Netriwati, 2018). Motivation, emotions, environment, and learning models influence critical thinking skills, communication, creativity, and collaboration (Huang et al., 2017). Using learning models is one of the critical success factors of a learning process. Learning models that meet good criteria will make an effective and efficient learning process (Mahjaty, 2017; Rubiah, 2016; Tang et al., 2021). Problem-based learning (PBL) model is a model characterized by the use of problems that exist in the real world. Problems are set as the starting point of the learning process, which motivates students to continue to investigate so that they can better understand the mechanics of the problem and its solution (Aslan, 2021; H. Li et al., 2021; Phungsuk et al., 2017) (Phungsuk et al., 2017). The problem-based learning (PBL) model is student-centered learning (Andersen & Rosio, 2021). Problem-based learning (PBL) is a non-traditional pedagogical model that focuses on students and collaborates in small groups (A.Montepara et al., 2021). According to (X. Li et al., 2020), learning in small groups can provide opportunities for students to construct ideas through social interaction. This small group of students will be guided by a tutor like a teacher (Virginie & Miklos, 2019).

The problem-based learning (PBL) model can train students to think critically and improve cooperative student attitudes (Seibert, 2020). This form of learning helps students learn about the material and forms the character of cooperation with other students, where they communicate and help each other solve problems (Suparno et al., 2019). In addition to using problem-based learning (PBL) models, educators must also involve learning media as learning aids, stimulating students' thoughts, attention, and abilities or skills to encourage an optimal learning process. One of the media that educators can use is a mentimeter. Media Mentimeter is an interactive presentation application. Mentimeter is an online application that offers significant advantages (Andriani et al., 2019; Sari, 2021). This application allows users to create presentations and receive audience input through polls, charts, quizzes, Q&A, and other interactive features. A mentimeter is used as a medium in learning when holding apperception or prompting questions during learning to activate students in learning (Gokbulut, 2020; Hasyyati & Zulherman, 2021). Mentimeters in

class improve learning quality by encouraging students to interact and discuss specific topics, even the most introverted students (Mahmashony, 2018; Wong & Yunus, 2020). Mentimeter offers collaborative learning as it allows students to share their thoughts as they post their ideas on the same page (Wong & Yunus, 2020). This media meter can use a problem-based learning (PBL) model.

Several previous findings related to the problem-based learning model have been carried out. There are differences in cognitive learning outcomes between students taught using a problem-based learning model (PBM) and those taught using conventional learning models (Damopolii et al., 2018). Students are learning to use PBM, become more active, and can solve problems given by the teacher very well. Applying problem-based learning (PBM) in thermodynamics course learning can improve students' cognitive and creative abilities compared to using powerpoint-assisted conventional knowledge (Rusydi, 2017; Sa'dulloh, 2021; Umbara et al., 2020). Problem-based learning models can improve student learning outcomes (Ariyani & Prasetyo, 2021; Lidyawati et al., 2017; Suana et al., 2017). Although research on problem-based learning models has been widely carried out, this research differs from previous research. This study uses a problem-based learning model with the aid of a mentimeter. This study aimed to analyze the effect of the problem-based learning (PBL) model with a mentometer on elementary school teacher education students' critical thinking and collaboration skills. Applying the problem-based learning model with the mentometer is expected to influence elementary school teacher education students' critical thinking and collaboration skills.

2. METHOD

The research used in this study was quasi-experimental (Sudarsana, 2018). The research design is a Pretest-Posttest Control Group Design using experimental and control classes (Fitriyyah & Wulandari, 2019). The research population was all 4th-grade 2nd-grade students. The research sample consisted of two classes, namely classes A7-21 and A8-21, which were taken by purposive sampling and simple random sampling. Class A7-21 was the experimental class treated using the Problem Based Learning (PBL) Model with the aid of a mentometer. Class A8-21 treated the control class treated using the Direct Instruction Model. The data collection technique uses the test method to obtain data on cognitive learning outcomes and the observation sheet method to obtain psychomotor learning outcomes (Santoso et al., 2013).

The technique used to analyze the data to test the research hypothesis is Multivariate Analysis of Variance (Manova). Before testing the hypothesis, several requirements must be met and need to be proven. The requirements in question are that the analyzed data must be normally distributed and know that the analyzed data is homogeneous. Both of these prerequisites must be proven first, so to fulfill this, a prerequisite analysis test is carried out by conducting a normality test and a homogeneity test. Normality test using SPSS 28.00 for windows Shapiro Wilk statistical test at a significance of 0.05. While the homogeneity of variance testing in this study was carried out using Levene's Test of Equality of Error Variance test with the help of SPSS through the Box's M test. The three hypotheses were tested using Multivariate Analysis of Variance (Manova). Hypotheses 1 and 2 were carried out with the F test of variance through Manova analysis using the Test of Between Subject Effects with the test criteria for a significance level of F = 5%, assisted by SPSS 28.00 for windows. While hypothesis 3 is carried out by F test through decisions taken by analysis of Pillae Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root, with test criteria for significance level F = 5%. If the F arithmetic significance number is less than 0.05, then the null hypothesis is rejected, and Ha is accepted.

3. RESULT AND DISCUSSION

Result

The data in this study are grouped into critical thinking skills taught using the PBL learning model assisted by the mentometer. Collaborative skills are learned using the PBL learning model assisted by the mentimeter media. Critical thinking skills are taught with educator-centered learning, and collaboration skills are taught with educator-centered learning. The results of the data analysis can be seen in Table 1.

Table 1. The results of calculating critical thinking skills and collaboration skills

Statistic	A1		A2	
	Y1	Y2	Y1	Y2
Number of Respondents	25	25	25	25
mean	87.36	80.72	65.32	75.68
Standard Deviation	6.3763	3.7807	6.9145	4.9642

variance	40.66	14.29	47.81	24.64
Minimum Score	78	74	50	66
Maximum Score	100	88	80	86

Table 1 shows that the experimental class's average value of critical thinking ability is 87.36, which is greater than the average value of the control class, which is 65.32. Likewise, the average value of collaboration skills in the experimental class is 80.72, which is higher than the average value of collaboration skills in the control class, which is 75.68. Before testing the hypothesis, the data on students' critical thinking and collaboration skills were tested with prerequisites, namely the normality and homogeneity tests. After all the data is obtained, the next step is to analyze the data. The first step is to perform a data normality test to measure whether the analyzed data is normally distributed so that it can be used in parametric statistics. The normality test was performed using Shapiro Wilk by looking at the value of Shapiro Wilk and its Asymp.Sig. The criteria for acceptance of normality are if the significance value of the calculation results is greater than α = 0.05, then the distribution is normal. Otherwise, the distribution is declared abnormal if it is smaller than α = 0.05. The summary of the data normality test can be seen in Table 2.

Table 2. Normality test results

Tests of Normality							
	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Critical thinking skills	IPA A7	0.116	25	0.200	0.942	25	0.162
	IPA A8	0.116	25	0.200	0.980	25	0.886
Collaboration skills	IPA A7	0.127	25	0.200	0.970	25	0.644
	IPA A8	0.128	25	0.200	0.964	25	0.509

Based on Table 2, it is found that the significance value of this normality test is greater than = 0.05. Thus, it can be concluded that the overall data in the control and experimental groups are normally distributed. In this study, the homogeneity of variance test was carried out on the variance between the experimental and control groups. The homogeneity of variance test in this study was carried out using Levene's Test of Equality of Error Variance test with the help of SPSS through the Box's M test. The complete calculation of the homogeneity test for the distribution of data is presented in Table 3.

Table 3. The results of the homogeneity of variance

Box's Test of Equality of Covariance Matrices[a]	
Box's M	3.561
F	1.133
df1	3
df2	414720.000
Sig.	.334

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.
a. Design: Intercept + Kelas

Table 3 shows that the Box's M value produced is 3.561 (p = 0.334), where the value is 0.334 > 0.05, so it can be concluded that the covariance matrix between groups is assumed to be the same or homogeneous. Based on the prerequisite test of data analysis, it was found that the post-test results of the experimental and control groups were normal and homogeneous. After obtaining the results of the prerequisite test of data analysis, it is continued with testing the research hypothesis. From the results of data processing on hypotheses 1 and 2, the variance F test was carried out through Manova analysis using the Test of Between Subject Effects with the test criteria for a significance level of F = 5%, if the F arithmetic significance number was less than 0.05 then the null hypothesis was rejected, and Ha received. The test calculations are presented in Table 4.

Table 4. The results of the f variant test using the test of between subject effects

Tests of Between-Subjects Effects							
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	Critical thinking skills	6072.020	1	6072.020	137.272	<0.001	0.741
Model	Collaboration skills	317.520	1	317.520	16.310	<0.001	0.254
Intercept	Critical thinking skills	291389.780	1	291389.780	6587.561	<0.001	0.993
	Collaboration skills	305762.000	1	305762.000	15705.607	<0.001	0.997
Kelas	Critical thinking skills	6072.020	**1**	6072.020	**137.272**	**<0.001**	0.741
	Collaboration skills	317.520	**1**	317.520	**16.310**	**<0.001**	0.254
Error	Critical thinking skills	2123.200	48	44.233			
	Collaboration skills	934.480	48	19.468			
Total	Critical thinking skills	299585.000	50				
	Collaboration skills	307014.000	50				
Corrected	Critical thinking skills	8195.220	49				
Total	Collaboration skills	1252.000	49				

From the results of data processing shown in table 4, it can be described that in the first hypothesis, the calculated F value is 137.272 df = 1, and sig = <0.05. It means significance < 0.05. Thus the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted. So based on the results of the analysis of the first hypothesis, there is a significant difference in critical thinking skills between experimental class students (IPA A7) who were taught by the problem-based learning (PBL) learning model with the aid of a metered media and control class students (IPA A8) who were taught by learning direct. Furthermore, in the second hypothesis, the study results show that the calculated F value is 16.310 df = 1, and sig = <0.05. It means significance < 0.05. Thus the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted. So, based on the results of the analysis of the second hypothesis, the collaboration skills between experimental class students (IPA A7) who were taught using a problem-based learning (PBL) learning model assisted by a mentometer and control class students (IPA A8) who were taught by direct learning. The third hypothesis, carried out by the F test through the decisions taken by the analysis of Pillae Trace, Wilk Lambda, Hotelling's Trace, and Roy's Largest Root, with the test criteria of significance level F = 5%. If the F arithmetic significance number is less than 0.05, then the null hypothesis is rejected, and Ha is accepted. The test calculations are presented in Table 5.

Table 5. Multivariate Test Results

Multivariate Tests						
	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	0.747	69.426	2.000	47.000	<0.001	0.747
Wilks' lambda	0.253	69.426	2.000	47.000	<0.001	0.747
Hotelling's trace	2.954	69.426	2.000	47.000	<0.001	0.747
Roy's largest root	2.954	69.426	2.000	47.000	<0.001	0.747

Based on table 5, the results show that the F count of Pillae Trace (F count = 69.426), Wilk Lambda (F count = 69.426), Hotelling's Trace (F count = 69.426), Roy's Largest Root (F count = 69.426), all have significance <0.05, so the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted. Thus, based on the analysis of the third hypothesis, there is a significant difference in critical thinking skills and collaboration skills jointly between experimental class students (IPA A7) who were taught using the problem-based learning (PBL) learning model with the aid of a metered media and control class students (IPA A8) which is taught by direct learning.

Discussion

Based on the research results obtained, several results. First, there is a significant difference in critical thinking skills between experimental class students (IPA A7) who were taught using a problem-based learning (PBL) model with the aid of a mentometer and control class students (IPA A8) who were taught by direct learning. Looking at the data from the research, theoretically, it can be said that the PBL model with the aid of the metered media is better and more effective in improving critical thinking skills in the learning process. The PBL model assisted by the mentometer is a model and learning media that can

improve students' critical thinking skills. Students not only have to understand relevant concepts but are required to have critical thinking skills and adapt to new knowledge to cultivate higher-order thinking patterns (Ariyani & Prasetyo, 2021; Mutakinati et al., 2018; Silberman et al., 2021). Students who use problem-based learning models show better thinking skills than expository learning models (Elizabeth & Sigahitong, 2018). The higher the thinking process, the higher the thinking skills needed (Afriansyah et al., 2020; Ariani, 2020). Therefore, the PBL model, with the aid of a mentimeter, is better and more effective in improving critical thinking skills in the learning process.

Second, the PBL learning model assisted by the media meter is better and more effective in improving student collaboration skills in the learning process. Applying the PBL learning model with the aid of a mentometer can make students able to express ideas or ideas based on problems, exchange information, receive the results of ideas or ideas between group members and present the results of group discussions. Students also have good initiative and responsibility in completing individual or group tasks that have been divided to achieve common goals. All group members are responsible for seeking information, data, and supporting facts through various sources to solve problems. After obtaining data and information related to the problem, students make compromises in making decisions from the facts, information, and data obtained. It is under the statement that collaborative learning requires students to learn together or in groups (teamwork) (Fahmi et al., 2020). The attitude of collaboration is very important to be accustomed to students so that students have skills in group collaboration effectively, adapt to various roles and responsibilities, work productively with others, have empathy and respect for different perspectives, can compromise with members in the group to achieve the goals that have been set (Anggelita et al., 2020; Fahmi et al., 2020; Hidayanti et al., 2020). Collaborative skills of students in groups cause each member to work together in solving problems so that they can achieve certain goals (Sunbanu et al., 2019).

Third, there are significant differences in critical thinking skills and collaborative skills between experimental class students (IPA A7) who were taught the problem-based learning (PBL) model with the aid of a metered media and control class students (IPA A8) who were taught using direct learning. Looking at the data from the research, theoretically, it can be said that the PBL learning model assisted by the media meter is better and more effective in improving critical thinking and collaboration skills in the learning process. It can be realized because the PBL learning model emphasizes the importance of social interaction between students and collaboration to solve problems so that learning is fun and meaningful (Asyari et al., 2016; Nurhayati et al., 2015; Yazar Soyadı, 2015). Each student is prepared for collaborative activities, working in pairs, gathering ideas, and sharing their thoughts or solutions with all colleagues (Anjelina Putri et al., 2018; Handayani & Koeswanti, 2021; Jayadiningrat & Ati, 2018). Students are learning to use PBM, become more active, and can solve problems given by the teacher very well (Aufa et al., 2020; Mulyani, 2020).

This finding is reinforced by previous findings, which state that there are differences in students' cognitive learning outcomes who are taught using a problem-based learning model (PBM) and a conventional learning model (Damopolii et al., 2018). Problem-based learning (PBM) can improve students' cognitive and creative abilities with the help of PowerPoint (Rusydi, 2017; Sa'dulloh, 2021; Umbara et al., 2020). Problem-based learning models can improve student learning outcomes (Ariyani & Prasetyo, 2021; Lidyawati et al., 2017; Suana et al., 2017). Based on the data analysis and relevant research results, it is evident that there is an effect of Problem Based Learning (PBL) assisted by a mentometer on students' critical thinking and collaboration skills. From the discussion description, the Problem Based Learning (PBL) learning model assisted by the media meter implemented by the lecturer will greatly affect students' critical thinking and collaboration skills and can improve students' critical thinking skills and collaboration skills. This research implies that it is expected to improve critical thinking and collaboration skills through applying a problem-based learning model with the aid of a mentimeter.

4. CONCLUSION

The problem-based learning (PBL) model assisted by the mentometer influences the critical thinking and collaboration skills of UPY PGSD students in science learning. Furthermore, it is expected that science and other learning educators can use problem-based learning models and measure media as an alternative model and learning media in schools and universities. So educators must pay attention to the presentation of teaching materials in the form of something new and attract the attention and interest of students, embrace students in learning and link learning with students themselves, involve students in the learning process, and invite students to solve learning problems with the knowledge they have as efforts to improve the quality of education, especially science courses related to critical thinking skills and collaboration skills.

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