Jurnal Penelitian dan Evaluasi Pendidikan
Volume 26, No 2, December 2022 (233-250)
Online: http://journal.uny.ac.id/index.php/jpep

A comparative study: Students' process skills and students' analytical thinking with learning models

Kamid*; Dwi Agus Kurniawan; Adriyan Ardi Rahman
Universitas Jambi, Indonesia
*Corresponding Author. E-mail: kamid.math@unja.ac.id

ARTICLE INFO

Article History
Submitted:
17 September 2022
Revised:
30 December 2022
Accepted:
31 December 2022

Keywords
thinking; process skills; STAD learning model

ABSTRACT

The purpose of this study was to find out a comparison of students' process skills with students' analytical thinking with the learning model at Batang Hari Middle School on student perceptions to determine the relationship of learning models to students' analytical thinking skills in Mathematics and to find out the relationship between learning models and process skills. The method used in this study is a quantitative method with a comparative type. The results of the description test can be concluded that one SMP in Batang Hari is superior to the others. Based on the results of the t-test, it can be concluded that there is a comparison between the thinking and processing skills of students using the STAD learning model. The correlation test results show a relationship between the learning model and the process skills and analytical thinking of Batang Hari Junior High School students.

Scan Me:

How to cite:
Kamid, K., Kurniawan, D., & Rahman, A. (2022). A comparative study: Students' process skills and students' analytical thinking with learning models. *Jurnal Penelitian dan Evaluasi Pendidikan, 26*(2), 233-250. doi:https://doi.org/10.21831/pep.v26i2.53326

INTRODUCTION

Education is very important in developing attitudes, achievements and quality of human resources in order to create progress in the nation (Abdulah et al., 2021; Hekmah et al., 2019; Mahendra, 2017). Education is a continuous learning process in social activities to acquire knowledge, skills, attitudes and thinking abilities carried out by a person to develop individuals (Abbas & Hidayat, 2018; Hidayat, 2017; Rosidin et al., 2019). Education can be interpreted as an approach to improve the quality of education, by focusing on methods, teaching and learning (Cai et al., 2020; Campbell et al., 2017; Quay, 2016). In education, there are various kinds of subjects, one of which is mathematics.

Mathematics is a science that studies all things about numbers. In addition to studying numbers, mathematics is a scholar that studies all of nature (Riananda et al., 2019; Suryawan & Listiari, 2018; Walker, 1983). The ultimate goal of learning mathematics is that students can apply some mathematical material into everyday life (Anriani & Pamungkas, 2018; Krisnayanti et al., 2020; Saraswati & Agustika, 2020). Mathematics lessons have been taught since they were in school, one of the materials taught is flat shapes (Fitriani et al., 2021; Purwandari & Wahyuningtyas, 2017; Winarso & Karimah, 2017). Therefore, students can understand mathematics learning process skills can affect student learning outcomes.

Process skills are one way for students to understand learning. Skills are very important for students to increase creativity and knowledge through learning activities (Stender et al.,

10.21831/pep.v26i2.53326

2018; Vansteensel et al., 2017; Vartiainen & Kumpulainen, 2020). One of the student skills is being able to acquire analytical concepts and observations (Labouta et al., 2018; Solé-Llussà et al., 2022; Stylinski et al., 2020). Student skills can be obtained from learners who require students to experience for themselves, seek, try, and draw conclusions (Kruit et al., 2018; Mutlu, 2020; Solé-Llussà et al., 2021). Analytical thinking is the ability to describe or break down a problem into several parts, and is only possessed by students who have mastered the ability to understand and apply (Hasyim, 2018; Ikhwanuddin et al., 2010; Ilma et al., 2017). In addition to student process skills, learning models also include factors that affect student learning outcomes.

The learning model in Indonesia is very diverse in education. The use of learning models greatly affects the learning process and outcomes (Brinus et al., 2019; Cahyaningrum et al., 2019; Hanifah et al., 2019). In learning students are required to experience for themselves, seek, try and draw conclusions on the process of the skills they do (Baken et al., 2022; Booker, 2021; Chang & Benson, 2022). In order for the learning objectives to reach the target properly, it is necessary to select appropriate learning methods and strategies (Anugraheni, 2018; Kristanti & Julia, 2017; Mansur & Rafiudin, 2020). There are various learning models that can be used for learning, including STAD.

STAD is one of the popular learning models used. The STAD model is a model that assigns students to form four or five member learning teams mixed in performance level, gender, and ethnicity (Kougiali et al., 2020; Prananda, 2019; Rulyansah et al., 2019). The development of a learning model with the STAD model greatly affects learning outcomes, it is expected to increase students' understanding of concepts (Septian et al., 2020; Slavin, 2005; Widayanti, 2019). The STAD type learning model is one of the learning models that is useful for fostering cooperative, creative abilities, think critically and help (Israil, 2019; Sadeghi & Ghaderi, 2018; Santos et al., 2019). The use of the right learning model supports the formation of analytical thinking that is in line with the educator's plan.

Thinking analysis is a skill to describe a structure into components to know the organization of the structure. The ability to think analytically is one of the important skills that students must master in learning mathematics because it can help students think logically about the relationship between concepts and situations they face easily (Firdaus et al., 2019; Ilma et al., 2017; Kharisma, 2018). Analytical thinking processes play an important role in representing the logical structure of mathematical knowledge (Men, 2017; Salbiah, 2017; Setiawan, 2020). Analytical thinking can also train students to learn meaningfully, not only understanding relevant knowledge but also being able to use what has been learned to solve mathematical problems (Destino et al., 2019; Nuryanti et al., 2018; Yanti & Prahmana, 2017).

This study is in line with research (Gasila et al., 2019; Mahmud, 2017; Siswono, 2017) that the implementation of STAD-type cooperative learning affects students' process skills in increasing activity and understanding. However, there are some differences and innovations, in previous studies only discussing one indicator used in process skills. In contrast to research (Ilma et al., 2017; Nuryanti et al., 2018; Yanti & Prahmana, 2017) that previous research only discussed analytical and critical thinking variables associated with mathematics subjects. Therefore, the purpose of this study is: to find the relationship and differences between student responses using the STAD learning model with analytical thinking and student process skills on mathematics subjects. The formulation of the problem from this research are: (1) What is the difference between student responses and process skills using the STAD learning model in mathematics? (2) What is the difference between student responses and analytical thinking using the STAD learning model in mathematics? (3) How is the relationship between student responses and process skills using the STAD learning model in mathematics? (4) How is the relationship between student responses and analytical thinking using the STAD learning model in mathematics?

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

RESEARCH METHOD

Type of Research

This study uses quantitative methods with associative and comparative types. Quantitative research is a field of inquiry that stands alone, is scientific in nature and aims to understand social reality (Manzilati, 2017; Rukin, 2019; Suwendra, 2018). The data were obtained using numerical data with a Likert scale of 4 and a Likert scale of 5. Survey research design is a procedure in quantitative research in which the research manages a survey of a sample or population for to describe the respondents' attitudes, opinions, behaviors, or characteristics.

Population and Sample

The sample in this study were 90 students of SMPN 34 Batang Hari and 90 students of SMPN 35 Batang Hari, with each school taking three classes containing 30 students in each class. The population is the person who is the subject of research or the characteristics to be studied (Banks et al., 2018; Roflin et al., 2021; Tegeh et al., 2020). The reason for taking this technique is because not all samples have criteria that match the phenomenon being studied. The most important thing in sampling should consider the analysis of the sample. The samples taken were students from class 8A, class 8B, and class 8C in each school, namely SMPN 34 Batang Hari and SMPN 35 Batang Hari with 15 male students and 15 female students. The research samples used in this study are shown in Table 1.

Table 1. Research Sample

Genre	SMPN 34 Batang Hari			SMPN 35 Batang Hari		
	Class			Class		
	VIII A	VIII B	VIII C	VIII A	VIII B	VIII C
Female	15	15	15	15	15	15
Male	15	15	15	15	15	15

Research Instrument

Instruments in this study are process skills, analytical thinking, and student responses with STAD model. Research data collection comes from research instruments derived from questionnaires (Cohen et al., 2013). Process skills instrument is in the form of a questionnaire with 47 valid question items using a Likert scale. The scale consists of four points with a score of strongly agree is 4, agree is 3, disagree is 2, and strongly disagree is 1. Each statement is representative of each attitude indicator. The focus of this research is on 12 dimensions of processing skills: observation, communication, classification, measuring, inferring, predicting, compiling tables, obtaining and processing data, analyzing experiments, making hypotheses, designing experiments, and conducting experiments. The analytical thinking instrument is in the form of a questionnaire with 20 valid question items using a Likert scale. The Likert scale consists of five points with a very good score of 5, good 4, quite 3, not good 2, and very not good 1. The focus of this research is on six dimensions of analytical thinking: understanding concepts, identifying, distinguishing, organizing, connecting, and application capabilities. In the student response with the STAD model, there are 26 valid question items using a Likert scale with five points. The focus of this research is on four dimensions of student response with the STAD model: enthusiasm in participating in learning, using media, interest in learning mathematics, easy understanding of concepts, and the importance of mathematics in life. The attachment grid for this research observation is shown in Table 2, Table 3, and Table 4. Due to the attachment of observation of analytical thinking and processing skills as well as student responses with STAD model to mathematics using a Likert scale, there is an interval for each indicator tested. The intervals for the indicators tested are in Table 5, Table 6, and Table 7.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Table 2. Grid of Student Process Skills Observation Sheet Instruments on Mathematics

Variable	Indicator	No. Statement Items
Process skills of students towards mathematics	Observation	1, 2, 3
	Communication	4, 5, 6, 7
	Classification	8, 9, 10, 11, 12
	Measure	13, 14, 15
	Conclusion	16, 17, 18, 19
	Prediction	20, 21, 22, 23, 24
	Arrange Table	25, 26, 27
	Obtaining and Processing Data	28, 29, 30, 31
	Experimental Analysis	32, 33, 34, 35
	Creating a Hypothesis	36, 37, 38
	Designing Experiments	39, 40, 41, 42, 43
	Doing Experiments	44, 45, 46, 47
Number of Statements		**48**

Table 3. Grid of Student Response Observation Reports Using the STAD Model on Mathematics

Variable	Indicator	No. Statement Items
Students' analytical thinking towards mathematics	Understanding the concept	1, 2, 3, 4
	Identify	5, 6, 7
	Distinguish	8, 9, 10
	Organize	11, 12, 13
	Connect	14, 15, 16
	Applicable ability	17, 18, 19, 20
Number of Statements		**20**

Table 4. Grid of Student Response Observation Reports Using the STAD Model on Mathematics

Variable	Indicator	No. Statement Items
Student responses with the STAD model to mathematics	Enthusiasm for learning	1, 2, 3, 4, 5, 6
	Media use	7, 8, 9, 10, 11, 12, 13
	Interest in learning mathematics	14, 15, 16, 17, 18, 19, 20
	Easy to understand the concept and importance of mathematics	21, 22, 23, 24, 25, 26
Number of Statements		**26**

Table 5. Categories of Students' Process Skills towards Mathematics

Category	Indicator Interval	
	Observation	**Classification**
Not Good	3.0-5.25	5.0.-8.75
Enough	5.26-7.50	8.76-12.5
Good	7.51-9.75	12.6-16.25
Very Good	9.76-12.00	16.26-20,0

Table 6. Categories of Students' Analytical Thinking towards Mathematics

Category	Indicator Interval					
	Understanding the Concept	**Identify**	**Distinguish**	**Organize**	**Connect**	**Applicable Ability**
Very Not Good	20.0-39.0	20.0-39.0	20.0-39.0	20.0-39.0	20.0-39.0	20.0-39.0
Not good	39.1-58.0	39.1-58.0	39.1-58.0	39.1-58.0	39.1-58.0	39.1-58.0
Enough	58.1-77.0	58.1-77.0	58.1-77.0	58.1-77.0	58.1-77.0	58.1-77.0
Good	77.1-96.0	77.1-96.0	77.1-96.0	77.1-96.0	77.1-96.0	77.1-96.0
Very good	96.1-115.0	96.1-115.0	96.1-115.0	96.1-115.0	96.1-115.0	96.1-115.0

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Table 7. Categories of Students' Response with STAD Model towards Mathematics

Category	Interval Indicator			
	Enthusiasm in Participating in Learning	**Media Use**	**Interest in Learning Mathematics**	**Easy to Understand the Concept and Importance of Mathematics**
Very Not Good	26.0-46.8	26.0-46.8	26.0-46.8	26.0-46.8
Not Good	46.9-67.6	46.9-67.6	46.9-67.6	46.9-67.6
Enough	67.7-88.4	67.7-88.4	67.7-88.4	67.7-88.4
Good	88.5-109.2	88.5-109.2	88.5-109.2	88.5-109.2
Very Good	109.3-130	109.3-130	109.3-130	109.3-130

Data Analysis Technique

The sampling technique used in this study used simple random sampling. Using random sampling can reduce the potential for bias in the selection of cases to be included in the sample. The sampling technique was adopted because it provides unbiased parameter estimates and is better if the population is homogeneous (Alhassan, 2019; Bankole & Nasir, 2021; Ning & Tao, 2020). 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 students' questionnaire answers regarding processing skills were analyzed using descriptive statistics. By using this type of associative research to determine the relationship or type of the variables used. Therefore, differential statistics are used with assumption tests consisting of normality, linearity and homogeneity tests as well as hypothesis testing, namely T test and correlation test. 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. Normality test if the result data in the population is normally distributed, the condition is that the sig value is greater than 0.05 (Awaludin et al., 2020; Dehadri & Dehdari, 2022; Kim et al., 2018). 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 homogeny 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.

Research Procedure

Descriptive statistics based on the categories given by the researchers was used in collecting data in the form of attitude activities carried out. The data needed in this study were collected and obtained from SMPN 34 Batang Hari and SMPN 35 Batang Hari. There is also a procedure for collecting data in this research, in accordance with the chart shown in Figure 1.

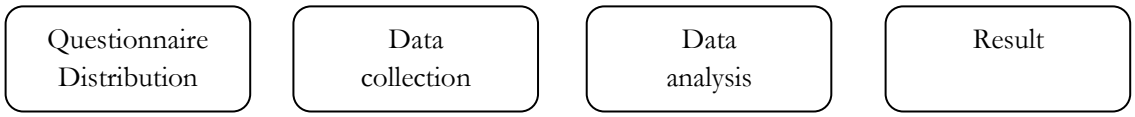

Figure 1. Research Procedure

FINDINGS AND DISCUSSION

Findings

This section presents the results obtained from the school data of SMPN 34 Batang Hari and SMPN 35 Batang Hari for class 8A, class 8B, and class 8C. The results are elaborated as follows.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Descriptive Statistics Test

This section presents the result of the descriptive statistics test. The descriptive process skills of junior high school students towards mathematics on observation indicators are presented in Table 8.

Table 8. Descriptive Process Skills of Junior High School Students towards Mathematics on Observation Indicators

Student Response	Class	Interval	F	%	Category	Mean	Median	Min	Max
SMPN 34 Batang Hari	VIII A	0	0	0	Very Not Good	2.67	3.00	2.00	4.00
		3.0-5.25	5	5.6	Not good				
		5.26-7.50	22	24.5	Enough				
		7.51-9.75	1	1.1	Good				
		9.76-12.00	2	2.2	Very good				
	VIII B	0	0	0	Very Not Good	2.90	3.00	2.00	4.00
		3.0-5.25	5	5.6	Not good				
		5.26-7.50	20	22.3	Enough				
		7.51-9.75	5	5.5	Good				
		9.76-12.00	0	0.0	Very good				
	VIII C	0	0	0	Very Not Good	2.87	3.00	2.00	4.00
		3.0-5.25	4	4.4	Not good				
		5.26-7.50	18	27.0	Enough				
		7.51-9.75	8	8.8	Good				
		9.76-12.00	0	0	Very good				
SMPN 35 Batang Hari	VIII A	0	0	0.0	Very Not Good	2.90	3.00	2.00	4.00
		3.0-5.25	5	5.6	Not good				
		5.26-7.50	23	25.6	Enough				
		7.51-9.75	2	2.2	Good				
		9.76-12.00	0	0.0	Very good				
	VIII B	0	0	0.0	Very Not Good	3.00	3.00	2.00	4.00
		3.0-5.25	2	2.2	Not good				
		5.26-7.50	26	28.9	Enough				
		7.51-9.75	2	2.2	Good				
		9.76-12.00	0	0.0	Very good				
	VIII C	0	0	0	Very Not Good	2.93	3.00	2.00	4.00
		3.0-5.25	3	3.3	Not good				
		5.26-7.50	20	22.3	Enough				
		7.51-9.75	7	7.7	Good				
		9.76-12.00	0	0	Very good				

Based on Table 8, the process skills of junior high school students towards mathematics on the observation indicators showed that the average junior high school students chose the sufficient category. Furthermore, the process skills of junior high school students towards mathematics on classification indicators can be seen in Table 9.

Based on Table 9, the process skills of junior high school students towards mathematics on the observation indicators show that, on average, junior high school students chose the sufficient category. In addition, junior high school students think analytically about mathematics. The results of junior high school students' analytical thinking towards mathematics are presented in Table 10.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Table 9. Descriptive Process Skills of Junior High School Students towards Mathematics on Classification Indicators

Student Response	Class	Interval	F	%	Category	Mean	Median	Min	Max
SMPN 34 Batang Hari	VIII A	0	0	0	Very Not Good	2.87	3.00	2.00	4.00
		5.0.-8.75	5	5.6	Not good				
		8.76-12.5	24	26.7	Enough				
		12.6-16.25	1	1.1	Good				
		16.26-20.0	0	0.0	Very good				
	VIII B	26.0-46.8	0	0	Very Not Good	2.87	3.00	2.00	4.00
		5.0.-8.75	5	5.6	Not good				
		8.76-12.5	24	26.7	Enough				
		12.6-16.25	1	1.1	Good				
		16.26-20.0	0	0.0	Very good				
	VIII C	0	0	0	Very Not Good	2.90	3.00	2.00	4.00
		5.0.-8.75	4	4.4	Not good				
		8.76-12.5	25	27.8	Enough				
		12.6-16.25	1	1.1	Good				
		16.26-20.0	0	0	Very good				
SMPN 35 Batang Hari	VIII A	0	0	0.0	Very Not Good	2.90	3.00	2.00	4.00
		5.0.-8.75	5	5.6	Not good				
		8.76-12.5	23	25.6	Enough				
		12.6-16.25	2	2.2	Good				
		16.26-20.0	0	0.0	Very good				
	VIII B	0	0	0.0	Very Not Good	3.00	3.00	2.00	4.00
		5.0.-8.75	2	2.2	Not good				
		8.76-12.5	26	28.9	Enough				
		12.6-16.25	2	2.2	Good				
		16.26-20.0	0	0.0	Very good				
	VIII C	0	0	0	Very Not Good	2.93	3.00	2.00	4.00
		5.0.-8.75	3	3.3	Not good				
		8.76-12.5	26	28.9	Enough				
		12.6-16.25	1	1.1	Good				
		16.26-20.0	0	0	Very good				

Table 10. Analytical Descriptive Statistics of Junior High School Students from Students' Perceptions of Mathematics

Student Response	Class	Interval	F	%	Category	Mean	Median	Min	Max
SMPN 34 Batang Hari	VIII A	20.0-39.0	0	0	Very Not Good	2.67	3.00	2.00	4.00
		39.1-58.0	5	5.6	Not good				
		58.1-77.0	22	24.5	Enough				
		77.1-96.0	1	1.1	Good				
		96.1-115.0	2	2.2	Very good				
	VIII B	20.0-39.0	0	0	Very Not Good	2.90	3.00	2.00	4.00
		39.1-58.0	5	5.6	Not good				
		58.1-77.0	20	22.3	Enough				
		77.1-96.0	5	5.5	Good				
		96.1-115.0	0	0.0	Very good				
	VIII C	20.0-39.0	7	7.7	Very Not Good	2.87	3.00	2.00	4.00
		39.1-58.0	4	4.4	Not good				
		58.1-77.0	18	27.0	Enough				
		77.1-96.0	1	1.1	Good				
		96.1-115.0	0	0	Very good				
SMPN 35 Batang Hari	VIII A	20.0-39.0	0	0.0	Very Not Good	2.90	3.00	2.00	4.00
		39.1-58.0	5	5.6	Not good				
		58.1-77.0	23	25.6	Enough				
		77.1-96.0	2	2.2	Good				
		96.1-115.0	0	0.0	Very good				
	VIII B	20.0-39.0	0	0.0	Very Not Good	3.00	3.00	2.00	4.00
		39.1-58.0	2	2.2	Not good				
		58.1-77.0	26	28.9	Enough				
		77.1-96.0	2	2.2	Good				
		96.1-115.0	0	0.0	Very good				
	VIII C	20.0-39.0	0	0	Very Not Good	2.93	3.00	2.00	4.00
		39.1-58.0	3	3.3	Not good				
		58.1-77.0	20	22.3	Enough				
		77.1-96.0	7	7.7	Good				
		96.1-115.0	0	0	Very good				

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Based on Table 10, the analytical thinking of junior high school students towards mathematics obtained that, on average, junior high school students chose the sufficient category. Furthermore, the responses of junior high school students with the STAD model on mathematics can be seen in Table 11.

Based on Table 11, junior high school students' responses with the STAD model to mathematics show that, on average, they chose the sufficient category. The next step is testing the normality of junior high school students' process skills on mathematics.

Table 11. Descriptive Responses of Junior High School Students Using the STAD Model to Mathematics

Student Response	Class	Interval	F	%	Category	Mean	Median	Min	Max
SMPN 34 Batang Hari	VIII A	26.0-46.8	0	0	Very Not Good	2.87	3.00	2.00	4.00
		46.9-67.6	5	5.6	Not good				
		67.7-88.4	24	26.7	Enough				
		88.5-109.2	1	1.1	Good				
		109.3-130	0	0.0	Very good				
	VIII B	26.0-46.8	0	0	Very Not Good	2.87	3.00	2.00	4.00
		46.9-67.6	5	5.6	Not good				
		67.7-88.4	24	26.7	Enough				
		88.5-109.2	1	1.1	Good				
		109.3-130	0	0.0	Very good				
	VIII C	26.0-46.8	0	0	Very Not Good	2.90	3.00	2.00	4.00
		46.9-67.6	4	4.4	Not good				
		67.7-88.4	25	27.8	Enough				
		88.5-109.2	1	1.1	Good				
		109.3-130	0	0	Very good				
SMPN 35 Batang Hari	VIII A	26.0-46.8	0	0.0	Very Not Good	2.90	3.00	2.00	4.00
		46.9-67.6	5	5.6	Not good				
		67.7-88.4	23	25.6	Enough				
		88.5-109.2	2	2.2	Good				
		109.3-130	0	0.0	Very good				
	VIII B	26.0-46.8	0	0.0	Very Not Good	3.00	3.00	2.00	4.00
		46.9-67.6	2	2.2	Not good				
		67.7-88.4	26	28.9	Enough				
		88.5-109.2	2	2.2	Good				
		109.3-130	0	0.0	Very good				
	VIII C	26.0-46.8	0	0	Very Not Good	2.93	3.00	2.00	4.00
		46.9-67.6	3	3.3	Not good				
		67.7-88.4	26	28.9	Enough				
		88.5-109.2	1	1.1	Good				
		109.3-130	0	0	Very good				

Normality Test

The data is normally distributed as seen from the significance value, if the significance value is > 0.05. The results of the normality test of junior high school students' process skills on student responses with the STAD model in mathematics subjects is described in Table 12.

Table 12. Normality Test of Junior High School Students' Process Skills on Student Responses Using the STAD Model in Mathematics

Variable	School name	N	Statistics	Sig.
Process Skills	SMPN 34 Batang Hari	90	0.778	0.875
	SMPN 35 Batang Hari	90	0.642	0.953
Analytical Thinking	SMPN 34 Batang Hari	90	0.856	0.754
	SMPN 35 Batang Hari	90	0.743	0.831

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Based on the results of Table 12, the normality test was obtained with the Kolmogorov-Smoniv test with a significance value > 0.05, it can be concluded that the data is normally distributed. The next step is testing the homogeneity of junior high school students on student responses with the STAD model in mathematics.

Homogeneity Test

This test is carried out in order to find out whether the x and y data are homogenous or not. The requirement in this test is that if the significance value is > 0.05, it can be said that the x and y data are homogeneous (same). If the significance value is < 0.05 then the data is not homogeneous (not the same). The results obtained are shown in Table 13 of the homogeneity test of junior high school students' process skills on student responses with the STAD model in mathematics subjects.

Table 13. Test of the Homogeneity of the Process Skills of Junior High School Students on the Responses of Students Using the STAD Model to Mathematics Seen from Students' Perceptions

Variable	School name	N	Statistics	Sig.
Process Skills	SMPN 34 Batang Hari	90	0.128	0.751
	SMPN 35 Batang Hari	90	0.098	0.453
Analytical Thinking	SMPN 34 Batang Hari	90	0.230	0.548
	SMPN 35 Batang Hari	90	0.173	0.652

Based on Table 13, the results of the homogeneity test obtained are a significance value of 0.751 for 34 junior high school students and 0.453 for 35 junior high school students on the process skills variable and 0.548 for 34 junior high school students and 0.652 for 35 junior high school students on the analytical thinking variable has met the requirements. > 0.05, it is concluded that the two variables are homogeneous. The next step is testing the linearity of junior high school students on their responses with the STAD model in mathematics subjects.

Linearity Test

This test is carried out in order to see a linear relationship between two or more variables. The requirements for this test, if the significance value is > 0.05. The results obtained in terms of the linearity test of junior high school students' process skills on student responses with the STAD model in mathematics are described in Table 14.

Table 14. Linearity Test of the Process Skills of Junior High School Students on the Responses of Students Using the STAD Model to Mathematics Seen from Students' Perceptions

Variable	School name	N	Statistics	Sig.
Process Skills	SMPN 34 Batang Hari	90	1.578	0.241
	SMPN 35 Batang Hari	90	1.051	0.379
Analytical Thinking	SMPN 34 Batang Hari	90	1.632	0.185
	SMPN 35 Batang Hari	90	1.374	0.254

Based on Table 14, the results of the linearity test obtained are a significance value of 0.241 for junior high school students 34 and 0.379 for junior high school 35 students on the process skills variable and 0.185 for junior high school 34 and 0.254 for junior high school 35 on critical thinking variables have met the requirements> 0.05, so it is concluded that there is a linear relationship between process skills and analytical thinking of 34 junior high school students and 35 junior high school students towards mathematics. The T-test of students' process skills on student responses with the STAD model in mathematics subjects is as follows.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

T Hypothesis Test

This test is conducted in order to know the difference between the variables on the multiplication of fractions material. The conditions in this test are if the significance value is >0.05, it can be said that these variables have differences, while if the significance value is <0.05, then the variable does not have a significant difference. The results obtained are shown in Table 15.

Table 15. T-test of Junior High School Students' Processing Skills on Student Responses Using the STAD Model of Environmental Pollution Seen from Students' Perceptions

Class	N	Mean	Sig.	Sig. (2-tailed)
SMPN 34 Batang Hari	180	131.5	0.841	0.010
SMPN 35 Batang Hari		128.12		

From Table 15, it can be seen that there is a difference between the junior high school students' process skills towards students' responses using the STAD model in Mathematics subject. It is proven by the value of Sig (2-tailed) > 0.05. Then, the T-test of students' analytical thinking towards students' responses to the STAD model in the Mathematics subject can be seen in Table 16.

Table 16. T-test of Analytical Thinking of Junior High School Students on Students' Responses to the STAD Model in Mathematics Seen from Students' Perceptions

Class	N	Mean	Sig.	Sig. (2-tailed)
SMPN 34 Batang Hari		120.14	0.659	0.005
MTsN 5 Batang Hari		121.37		

From Table 16, it can be seen that there is a difference between the analytical thinking of junior high school students and students' responses to mathematics. This is evidenced by the value of Sig (2-tailed) > 0.05. The next step is testing the correlation of SMPN students' process skills on student responses with the STAD model in mathematics subjects.

Correlation Test

This test is carried out in order to determine the relationship of variables to the material of multiplication of fractions. The conditions in this test if the significance value is > 0.05, it can be said that the variable has no relationship. If the significance value is <0.05, then the variable has a significant relationship. The results obtained in terms of the correlation test for the process skills of SMPN 34 Batang Hari students on student responses using the STAD model in Mathematics are described in Table 17.

Table 17. Correlation Test of Students' Process Skills at SMPN 34 Batang Hari on Students' Responses to the STAD Model in Mathematics Seen from Students' Perceptions

SMPN 34 Batang Hari	N	Pearson Correlation	Sig. (2-tailed)
Process Skills Student responses with the STAD learning model	90	0.683	0.007

From Table 17, it can be seen that there is a relationship between the process skills of SMP 34 Batang Hari students on student responses to the STAD model in mathematics. This is evidenced by the value of sig (2-tailed) < 0.05. The next step is testing the correlation of process skills of SMPN 35 Batang Hari students on student responses using the STAD model in Mathematics.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Table 18. Correlation Test of Students' Process Skills at SMPN 35 Batang Hari on Students' Responses to the STAD Model in Mathematics Seen from Students' Perceptions

SMPN 35 Batang Hari	N	Pearson Correlation	Sig. (2-tailed)
Process Skills Student responses with the STAD learning model	90	0.654	0.006

From Table 18, it can be seen that there is a relationship between the process skills of SMP 35 Batang Hari students on students' responses to the STAD model in Mathematics. This is evidenced by the value of sig (2-tailed) < 0.05. Furthermore, the correlation test of analytical thinking of SMPN 34 Batang Hari students on students' responses to the STAD model in Mathematics subject is as follows.

Table 19. Correlation Test of Analytical Thinking of Students at SMPN 34 Batang Hari on Students' Responses to the STAD Model in Mathematics Seen from Students' Perceptions

SMPN 34 Batang Hari	N	Pearson Correlation	Sig. (2-tailed)
Analytical thinking Student responses with the STAD learning model	90	0.742	0.005

From Table 19, it can be seen that there is a relationship between the analytical thinking of the students of SMP 34 Batang Hari on the students' responses to the STAD model in mathematics. This is evidenced by the value of sig (2-tailed) < 0.05. Furthermore, the correlation test of analytical thinking of SMPN 35 Batang Hari students on student responses using the STAD model in Mathematics subject is as follows.

Table 20. Correlation Test of Analytical Thinking of Students at SMPN 35 Batang Hari on Student Responses Using the STAD Model in Mathematics Seen from Students' Perceptions

SMPN 35 Batang Hari	N	Pearson Correlation	Sig. (2-tailed)
Analytical thinking Student responses with the STAD learning model	90	0.490	0.012

From Table 20, it can be seen that there is a relationship between analytical thinking of SMP 35 Batang Hari students on student responses with the STAD model in Mathematics. This is evidenced by the value of sig (2-tailed) < 0.05.

Discussion

Descriptive statistics is one type of statistic that processes statistical analysis more towards data management, presentation, and classification. In this way, the processed data will become more interesting and easier to understand. In this study, researchers took two indicators of process skills and one general indicator of analytical thinking. To see the results of descriptive statistical tests for grade 8A, grade 8B, and grade 8C at SMPN 34 Batang Hari and SMPN 35 Batang Hari. In the first indicator of process skills regarding observation, it was found that the percentage of students' process skills towards mathematics in all dominant classes was sufficient with the percentage for SMPN 34 class 8A 24.5%, class 8B 22.3%, and class 8C 27.0% for SMPN 35 grade 8A 25.6%, grade 8B 28.9%, and grade 8C 22.3%. In the second indicator of process skills regarding classification, the results show that the percentage of students' process skills towards mathematics in all dominant classes is sufficient with the percentage for SMPN 34 class 8A 26.7%, class 8B 26.7%, and class 8C 27.8%, for SMPN 35 grade 8A 25.6%, grade 8B 28.9%, and grade 8C 28.9%.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Furthermore, the analytical thinking indicator showed that the percentage of junior high school students' analytical thinking towards mathematics in all dominant classes was sufficient with the percentage for SMPN 34 class 8A 24.5%, class 8B 22.3%, and class 8C 27% for SMPN 35 class 8A 25.6%, 8B 28.9%, and 8C 22.3%. In the indicator of student response with the STAD model, it was found that the percentage of student responses with the STAD model to mathematics in all dominant classes was sufficient with the percentage for SMPN 34 class 8A 26.7%, class 8B 26.7%, and class 8C 27.8%. , for SMPN 35 class 8A 28.9%, class 8B 28.9% and class 8C 28.9%.

After conducting a descriptive test, the researchers also tested assumptions in the form of normality test, homogeneity test, and linearity test. In the normality test, seen from the table of students' process skills on student responses with the STAD model in mathematics, it can be concluded that the distribution is normal as seen from the value of sig > 0.05. For the normality test, seen from the students' analytical thinking table on student responses with the STAD model in mathematics, it can be concluded that the distribution is normal as seen from the value of sig > 0.05. In the homogeneity test and linearity test, it can be seen from the data that students' analytical thinking and process skills on student responses with the STAD model in mathematics can be concluded that the variable data is homogeneous and there is a linear relationship between students' analytical thinking and processing skills on student responses with the STAD model seen from sig value > 0.05%.

In testing the hypothesis, the researchers conducted a T test and a correlation test. Based on the T-test, it can be seen that there are differences in the process skills of SMP 34 and SMP 35 students to the students' responses to the STAD model, this is evident from the value of sig (2-tailed) > 0.05%. Based on the T test, it can be seen that there are differences in the ana-lytical thinking of SMP 34 and SMP 35 students towards the students' responses to the STAD model, this is evident from the sig (2-tailed) value > 0.05%. And finally the results of the correlation test can be seen that there is a relationship between process skills and analytical thinking of junior high school students on student responses to the STAD learning model in mathematics. This is evident from the value of sig (2-tailed) < 0.05%

This study is in line with some previous research (Gasila et al., 2019; Mahmud, 2017; Siswono, 2017) that the implementation of STAD-type cooperative learning affects students' process skills in increasing activity and understanding. However, there are some differences and innovations, in previous studies only discussing one indicator used in process skills. It is in contrast to some other research (Ilma et al., 2017; Nuryanti et al., 2018; Yanti & Prahmana, 2017) that previous research only discussed analytical and critical thinking variables associated with mathematics subjects.

In this study, the researchers chose the students' analytical thinking and process skills which aimed to understand the control, thought processes, motivational attitudes, and psychology faced by junior high school students in learning mathematics. By testing this, it can be seen that students' process skills and students' analytical thinking have an influence on the development of student learning in Mathematics. With process skills and good analytical thinking, students can develop knowledge, skills regarding mathematics lessons. Process skills and students' analytical thinking on the student's response with the STAD model can evaluate problems related to mathematics subjects. In this way, good analytical thinking and process skills are formed from each student.

The essence of this research discusses the differences and the relationship between the process skills and analytical thinking of junior high school students to the students' responses to the STAD model. In other words, these differences and relationships describe students' analytical thinking and process skills towards Mathematics. It is known that there are differences and correlations between process skills and analytical thinking of junior high school students on students' responses to the STAD model. The disadvantage of this research is that it only measures the variables of students' analytical thinking and process skills on the STAD

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

learning model and has not carried out testing with other variables such as self-efficacy, attitudes, interests, motivation, and others. Thus, it is advisable to read other articles that contain other variables.

CONCLUSION

Based on data testing and analysis, this study concludes that with a sample of junior high school analytical thinking and process skills on student responses with the STAD model in mathematics, as many as 180 students from two schools, namely SMPN 34 Batang Hari and SMPN 35 Batang Hari, with 90 students in each school. From the results obtained, there is a comparison of each school on each indicator, students' process skills in responding to the STAD model in subjects that are categorized as sufficient for each school, for students' analytical thinking variables on student responses with the STAD model in mathematics obtained for each category is sufficient. From the data generated in the test, it is known that the variables of analytical thinking and student process skills have significant differences in student responses with the STAD model between schools with a greater evidence value than the determination and the relationship between junior high school students and their variables. The value of sig smaller than determination proves process skills and analytical thinking on student responses with the STAD model.

REFERENCES

Abbas, A., & Hidayat, M. Y. (2018). Faktor-faktor kesulitan belajar Fisika pada peserta didik kelas IPA sekolah menengah atas. *JPF (Jurnal Pendidikan Fisika) Universitas Islam Negeri Alauddin Makassar*, *6*(1), 45–49. https://doi.org/10.24252/jpf.v6i1a8.

Abdulah, A., Mustadi, A., & Fitriani, W. (2021). PBL-based interactive multimedia in improving critical thinking skills. *JPI (Jurnal Pendidikan Indonesia)*, *10*(1), 136–144. https://doi.org/10.23887/jpi-undiksha.v10i1.25521.

Alhassan, A. (2019). Investigating business EFL postgraduate student writing in a UK university: A qualitative study. *Cogent Education*, *6*(1), 1699741. https://doi.org/10.1080/2331186X.2019.1699741.

Anriani, N., & Pamungkas, A. S. (2018). The development of mathematics teaching materials based higher order thinking skills in improving logical thinking skills. *Jurnal Pendidikan Dan Pengajaran*, *51*(3), 115–121. https://ejournal.undiksha.ac.id/index.php/JPP/article/view/15923.

Anugraheni, I. (2018). Meta analisis model pembelajaran Problem Based Learning dalam meningkatkan keterampilan berpikir kritis di sekolah dasar [A meta-analysis of Problem-Based Learning models in increasing critical thinking skills in elementary schools]. *Polyglot: Jurnal Ilmiah*, *14*(1), 9–18. https://doi.org/10.19166/pji.v14i1.789.

Awaludin, A., Wibawa, B., & Winarsih, M. (2020). Integral Calculus learning using Problem Based Learning model assisted by hypermedia-based e-book. *JPI (Jurnal Pendidikan Indonesia)*, *9*(2), 224–235. https://doi.org/10.23887/jpi-undiksha.v9i2.23106.

Baken, E. K., Adams, D. C., & Rentz, M. S. (2022). Jigsaw method improves learning and retention for observation-based undergraduate Biology laboratory activities. *Journal of Biological Education*, *56*(3), 317–322. https://doi.org/10.1080/00219266.2020.1796757.

Bankole, Q. A., & Nasir, Z. (2021). Empirical analysis of undergraduate students' perception in the use of electronic sources in Kwara State University library. *International Information & Library Review*, *53*(2), 131–141. https://doi.org/10.1080/10572317.2020.1805274.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Banks, H. T., Flores, K. B., Langlois, C. R., Serio, T. R., & Sindi, S. S. (2018). Estimating the rate of prion aggregate amplification in yeast with a generation and structured population model. *Inverse Problems in Science and Engineering*, *26*(2), 257–279. https://doi.org/10.1080/17415977.2017.1316498.

Booker, T. A. (2021). Taking a (modified) jigsaw to it: An in-class method to teach students to write a literature review. *College Teaching*, *69*(1), 58–60. https://doi.org/10.1080/87567555.2020.1809984.

Brinus, K. S. W., Makur, A. P., & Nendi, F. (2019). Pengaruh model pembelajaran kontekstual terhadap pemahaman konsep Matematika siswa SMP. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(2), 261–272. https://doi.org/10.31980/mosharafa.v8i2.439.

Cahyaningrum, A. D., AD, Y., & Asyhari, A. (2019). Pengaruh model pembelajaran Quantum Teaching tipe Tandur terhadap hasil belajar. *Indonesian Journal of Science and Mathematics Education*, *2*(3), 372–379. https://doi.org/10.24042/ijsme.v2i3.4363.

Cai, S., Liu, E., Shen, Y., Liu, C., Li, S., & Shen, Y. (2020). Probability learning in mathematics using augmented reality: Impact on student's learning gains and attitudes. *Interactive Learning Environments*, *28*(5), 560–573. https://doi.org/10.1080/10494820.2019.1696839.

Campbell, C., Pollock, K., Briscoe, P., Carr-Harris, S., & Tuters, S. (2017). Developing a knowledge network for applied education research to mobilise evidence in and for educational practice. *Educational Research*, *59*(2), 209–227. https://doi.org/10.1080/00131881.2017.1310364.

Chang, W.-L., & Benson, V. (2022). Jigsaw teaching method for collaboration on cloud platforms. *Innovations in Education and Teaching International*, *59*(1), 24–36. https://doi.org/10.1080/14703297.2020.1792332.

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*. Routledge.

Dehadri, T., & Dehdari, L. (2022). The effect of a short message-based nutrition education intervention on employees' knowledge and practice in terms of adopting the methods of inhibition of polycyclic aromatic hydrocarbons formation in the cooked meat. *Polycyclic Aromatic Compounds*, *42*(3), 897–906. https://doi.org/10.1080/10406638.2020.1754866.

Destino, M. D., Bharata, H., & Caswita, C. (2019). Pengembangan bahan ajar Transformasi Geometri berorientasi pada kemampuan bepikir kritis peserta didik. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *10*(1), 57–67. https://doi.org/10.15294/kreano.v10i1.18493.

Firdaus, A., Nisa, L. C., & Nadhifah, N. (2019). Kemampuan berpikir kritis siswa pada materi Barisan dan Deret berdasarkan gaya berpikir. *Kreano: Jurnal Matematika Kreatif-Inovatif*, *10*(1), 68–77. https://doi.org/10.15294/kreano.v10i1.17822.

Fitriani, W., Abdulah, A., & Mustadi, A. (2021). The use of PBL-based interactive multimedia to develop student science process skill. *Jurnal Pendidikan Dan Pengajaran*, *54*(1), 150–159. https://doi.org/10.23887/jpp.v54i1.34256.

Gasila, Y., Fadillah, S., & Wahyudi, W. (2019). Analisis keterampilan proses Sains siswa dalam menyelesaikan soal IPA di SMP Negeri Kota Pontianak. *Jurnal Inovasi Dan Pembelajaran Fisika*, *6*(1), 14–22. https://ejournal.unsri.ac.id/index.php/jipf/article/view/10399.

Hanifah, H., Supriadi, N., & Widyastuti, R. (2019). Pengaruh model pembelajaran E-learning berbantuan media pembelajaran Edmodo terhadap kemampuan pemecahan masalah matematis peserta didik. *Numerical: Jurnal Matematika Dan Pendidikan Matematika*, *3*(1), 31–42. https://doi.org/10.25217/numerical.v3i1.453.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Hasyim, F. (2018). Mengukur kemampuan berpikir analitis dan keterampilan proses sains mahasiswa calon guru Fisika STKIP Al Hikmah Surabaya. *JIPVA (Jurnal Pendidikan IPA Veteran)*, *2*(1), 80–89. https://doi.org/10.31331/jipva.v2i1.591.

Hekmah, N., Wilujeng, I., & Suryadarma, I. G. P. (2019). Web-Lembar Kerja Siswa IPA terintegrasi lingkungan untuk meningkatkan literasi lingkungan siswa. *Jurnal Inovasi Pendidikan IPA*, *5*(2), 129–138. https://doi.org/10.21831/jipi.v5i2.25402.

Hidayat, W. (2017). Adversity quotient dan penalaran kreatif matematis siswa SMA dalam pembelajaran Argument Driven Inquiry pada materi Turunan Fungsi. *KALAMATIKA: Jurnal Pendidikan Matematika*, *2*(1), 15–28. https://doi.org/10.22236/KALAMATIKA.vol2no1.2017pp15-28.

Ikhwanuddin, I., Jaedun, A., & Purwantoro, D. (2010). Problem solving dalam pembelajaran Fisika untuk meningkatkan kemampuan mahasiswa berpikir analitis. *Jurnal Kependidikan: Penelitian Inovasi Pembelajaran*, *40*(2), 215–230. https://journal.uny.ac.id/index.php/jk/article/view/500.

Ilma, R., Hamdani, A. S., & Lailiyah, S. (2017). Profil berpikir analitis masalah aljabar siswa ditinjau dari gaya kognitif visualizer dan verbalizer. *Jurnal Review Pembelajaran Matematika*, *2*(1), 1–14. https://doi.org/10.15642/jrpm.2017.2.1.1-14.

Israil, I. (2019). Implementasi model pembelajaran Cooperative Learning tipe STAD untuk meningkatkan motivasi belajar siswa dalam pembelajaran IPA di SMP Negeri 1 Kayangan. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *5*(2), 117–123. https://doi.org/10.33394/jk.v5i2.1807.

Kharisma, E. N. (2018). Analisis kemampuan berpikir kritis matematis siswa SMK pada materi Barisan dan Deret. *Jurnal Review Pembelajaran Matematika*, *3*(1), 62–75. https://doi.org/10.15642/jrpm.2018.3.1.62-75.

Kim, B., Park, S., Kim, K., Lim, J., & Nahm, K. (2018). Systematic process to determine DNBR limit of CHF correlation with repetitive cross-validation technique. *Journal of Nuclear Science and Technology*, *55*(9), 1034–1042. https://doi.org/10.1080/00223131.2018.1467287.

Kougiali, Z. G., Soar, K., Pytlik, A., Brown, J., Wozniak, K., Nsumba, F., Wilkins, T., Oliva, E., Osunsanya, S., Clarke, C., Casalotti, S., & Pendry, B. (2020). Jigsaw recovery: The spatio-temporalities of alcohol abuse and recovery in a non-interventionist, peer-led service. *Alcoholism Treatment Quarterly*, *38*(2), 165–183. https://doi.org/10.1080/07347324.2019.1686960.

Krisnayanti, N. K. E., Astawan, I. G., & Renda, N. T. (2020). Positive influence of model Guided Inquiry based on Tri Hita Karana for learning motivation and critical thinking skills. *Jurnal Pendidikan Dan Pengajaran*, *53*(2), 101–113. https://doi.org/10.23887/jpp.v53i2.25121.

Kristanti, D., & Julia, S. (2017). Pengembangan perangkat pembelajaran Matematika model 4-D untuk kelas inklusi sebagai upaya meningkatkan minat belajar siswa. *MAJU: Jurnal Ilmiah Pendidikan Matematika*, *4*(1), 38–50. https://ejournal.stkipbbm.ac.id/index.php/mtk/article/view/71.

Kruit, P. M., Oostdam, R. J., van den Berg, E., & Schuitema, J. A. (2018). Assessing students' ability in performing scientific inquiry: Instruments for measuring science skills in

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

primary education. *Research in Science & Technological Education*, *36*(4), 413–439. https://doi.org/10.1080/02635143.2017.1421530.

Labouta, H. I., Kenny, N. A., Li, R., Anikovskiy, M., Reid, L., & Cramb, D. T. (2018). Learning science by doing science: an authentic science process-learning model in postsecondary education. *International Journal of Science Education*, *40*(12), 1476–1492. https://doi.org/10.1080/09500693.2018.1484966.

Mahendra, I. W. E. (2017). Project Based Learning bermuatan etnomatematika dalam pembelajar Matematika. *Jurnal Pendidikan Indonesia*, *6*(1), 106–114. https://ejournal.undiksha.ac.id/index.php/JPI/article/view/9257.

Mahmud, N. (2017). Meningkatkan hasil belajar Matematika Operasi Hitung Pecahan pada siswa kelas V Sekolah Dasar Daruba 2 Kepulauan Morotai dengan menggunakan model pembelajaran Student Team Achievement Division (STAD). *Pedagogik*, *5*(1), 47–57. http://ejournal.unkhair.ac.id/index.php/pedagigk/article/view/1748.

Mansur, H., & Rafiudin, R. (2020). Pengembangan media pembelajaran infografis untuk meningkatkan minat belajar mahasiswa. *Jurnal Komunikasi Pendidikan*, *4*(1), 37–48. https://doi.org/10.32585/jkp.v4i1.443.

Manzilati, A. (2017). *Metodologi penelitian kualitatif: Paradigma, metode, dan aplikasi*. UB Press.

Men, F. E. (2017). Proses berpikir kritis siswa SMA dalam pengajuan soal Matematika berdasarkan tingkat kemampuan Matematika. *Jurnal Pendidikan Dan Kebudayaan Missio*, *9*(1), 35–42. https://unikastpaulus.ac.id/jurnal/index.php/jpkm/article/view/115.

Mutlu, A. (2020). Evaluation of students' scientific process skills through reflective worksheets in the inquiry-based learning environments. *Reflective Practice*, *21*(2), 271–286. https://doi.org/10.1080/14623943.2020.1736999.

Ning, J., & Tao, H. (2020). Randomized quasi-random sampling/importance resampling. *Communications in Statistics - Simulation and Computation*, *49*(12), 3367–3379. https://doi.org/10.1080/03610918.2018.1547398.

Nuryanti, L., Zubaidah, S., & Diantoro, M. (2018). Analisis kemampuan berpikir kritis siswa SMP. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *3*(2), 155–158. http://journal.um.ac.id/index.php/jptpp/article/view/10490.

Prananda, G. (2019). Pengaruh model pembelajaran Kooperatif tipe STAD dalam pembelajaran IPA siswa kelas V SD. *Jurnal Pedagogik*, *6*(2), 122–130. https://ejournal.unmuha.ac.id/index.php/pedagogik/article/view/648.

Purwandari, A., & Wahyuningtyas, D. T. (2017). Eksperimen model pembelajaran Teams Games Tournament (TGT) berbantuan media keranjang biji-bijian terhadap hasil belajar materi Perkalian dan Pembagian siswa kelas II SDN Saptorenggo 02. *Jurnal Ilmiah Sekolah Dasar*, *1*(3), 163–170. https://doi.org/10.23887/jisd.v1i3.11717.

Quay, J. (2016). Not 'democratic education' but 'democracy and education': Reconsidering Dewey's oft misunderstood introduction to the philosophy of education. *Educational Philosophy and Theory*, *48*(10), 1013–1028. https://doi.org/10.1080/00131857.2016.1174098.

Riananda, D. M., Subekti, E. E., & KHB, M. A. (2019). Implementasi metode Modelling the Way dengan permainan Mathchess untuk meningkatkan keterampilan perkalian. *Jurnal Ilmiah Sekolah Dasar*, *3*(4), 394–404. https://doi.org/10.23887/jisd.v3i4.21766.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Roflin, E., Liberty, I. A., & Pariyana, P. (2021). *Populasi, sampel, variabel dalam penelitian kedokteran*. PT. Nasya Expanding Management.

Rosidin, U., Kadaritna, N., & Hasnunidah, N. (2019). Can Argument-Driven Inquiry models have impact on critical thinking skills for students with different personality types? *Jurnal Cakrawala Pendidikan*, *38*(3), 511–526. https://doi.org/10.21831/cp.v38i3.24725.

Rukin, R. (2019). *Metodologi penelitian kualitatif*. Yayasan Ahmar Cendekia Indonesia.

Rulyansah, A., Wardana, L. A., & Hasanah, I. U. (2019). Pengembangan media pembelajaran Pop Up dengan menggunakan model STAD dalam meningkatkan hasil belajar siswa (Materi Lingkungan Sekitar kelas III SDI Darul Hidayah). *Pedagogy: Jurnal Ilmiah Ilmu Pendidikan*, *6*(1), 53–59. https://ejournal.upm.ac.id/index.php/pedagogy/article/view/330.

Sadeghi, K., & Ghaderi, F. (2018). Pre-task planning and explicit instruction: Effects on CALF in an oral jigsaw task and gains in linguistic knowledge. *Southern African Linguistics and Applied Language Studies*, *36*(4), 365–378. https://doi.org/10.2989/16073614.2018.1548298.

Salbiah, S. (2017). Profil keterampilan berpikir kritis siswa menggunakan pembelajaran Discovery Inquiry pada konsep Koloid. *JTK (Jurnal Tadris Kimiya)*, *2*(1), 109–115. https://doi.org/10.15575/jta.v2i1.1367.

Santos, M. E. A., Wirtz, P., Montenegro, J., Kise, H., López, C., Brown, J., & Reimer, J. D. (2019). Diversity of Saint Helena Island and zoogeography of zoantharians in the Atlantic Ocean: Jigsaw falling into place. *Systematics and Biodiversity*, *17*(2), 165–178. https://doi.org/10.1080/14772000.2019.1572667.

Saraswati, P. M. S., & Agustika, G. N. S. (2020). Kemampuan berpikir tingkat tinggi dalam menyelesaikan soal HOTS mata pelajaran Matematika. *Jurnal Ilmiah Sekolah Dasar*, *4*(2), 257–269. https://doi.org/10.23887/jisd.v4i2.25336.

Septian, A., Agustina, D., & Maghfirah, D. (2020). Model pembelajaran kooperatif tipe Student Teams Achievement Division (STAD) untuk meningkatkan pemahaman konsep Matematika. *MATHEMA: Jurnal Pendidikan Matematika*, *2*(2), 10–22. https://doi.org/10.33365/jm.v2i2.652.

Setiawan, Y. E. (2020). Analisis kesalahan siswa dalam menilai kebenaran suatu pernyataan. *Jurnal Didaktik Matematika*, *7*(1), 13–31. https://doi.org/10.24815/jdm.v7i1.14495.

Siswono, H. (2017). Analisis pengaruh keterampilan proses Sains terhadap penguasaan konsep Fisika siswa. *Momentum: Physics Education Journal*, *1*(2), 83–90. https://doi.org/10.21067/mpej.v1i2.1967.

Slavin, R. E. (2005). *Cooperative learning: Teori, riset, dan praktik* (Z. Zubaedi (ed.); N. Yusron (trans.)). Nusamedia.

Solé-Llussà, A., Aguilar, D., & Ibáñez, M. (2021). Video worked examples to promote elementary students' science process skills: A fruit decomposition inquiry activity. *Journal of Biological Education*, *55*(4), 368–379. https://doi.org/10.1080/00219266.2019.1699149.

Solé-Llussà, A., Aguilar, D., & Ibáñez, M. (2022). Video-worked examples to support the development of elementary students' science process skills: A case study in an inquiry activity on electrical circuits. *Research in Science & Technological Education*, *40*(2), 251–271. https://doi.org/10.1080/02635143.2020.1786361.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061

10.21831/pep.v26i2.53326

Stender, A., Schwichow, M., Zimmerman, C., & Härtig, H. (2018). Making inquiry-based science learning visible: The influence of CVS and cognitive skills on content knowledge learning in guided inquiry. *International Journal of Science Education*, *40*(15), 1812–1831. https://doi.org/10.1080/09500693.2018.1504346.

Stylinski, C. D., Peterman, K., Phillips, T., Linhart, J., & Becker-Klein, R. (2020). Assessing science inquiry skills of citizen science volunteers: A snapshot of the field. *International Journal of Science Education, Part B*, *10*(1), 77–92. https://doi.org/10.1080/21548455.2020.1719288.

Suryawan, I. P. P., & Listiari, P. N. (2018). Improving mathematical communication skills through the implementation ofreasoning and problem solving model. *Jurnal Pendidikan Dan Pengajaran*, *51*(2), 68–80. https://ejournal.undiksha.ac.id/index.php/JPP/article/view/13966.

Suwendra, I. W. (2018). *Metodologi penelitian kualitatif dalam ilmu sosial, pendidikan, kebudayaan, dan keagamaan*. Nilacakra.

Tegeh, I. M., Parwata, I. G. L. A., & Ostaviani, B. G. (2020). The observing learning activity assisted by concrete media improves student's conceptual knowledge. *JPI (Jurnal Pendidikan Indonesia)*, *9*(2), 182–192. https://doi.org/10.23887/jpi-undiksha.v9i2.25206.

Vansteensel, M. J., Kristo, G., Aarnoutse, E. J., & Ramsey, N. F. (2017). The brain-computer interface researcher's questionnaire: From research to application. *Brain-Computer Interfaces*, *4*(4), 236–247. https://doi.org/10.1080/2326263X.2017.1366237.

Vartiainen, J., & Kumpulainen, K. (2020). Playing with science: Manifestation of scientific play in early science inquiry. *European Early Childhood Education Research Journal*, *28*(4), 490–503. https://doi.org/10.1080/1350293X.2020.1783924.

Walker, G. (1983). Improving the quality of learning. *Gifted Education International*, *1*(2), 117–119. https://doi.org/10.1177/026142948300100217.

Widayanti, E. (2019). The implementation of Problem Based Learning and Jigsaw Model Learning to improve basic programming learning outcomes. *International Journal of Education and Learning*, *1*(2), 89–97. https://doi.org/10.31763/ijele.v1i2.53.

Winarso, W., & Karimah, S. A. (2017). The influence of implementation brain-friendly learning through the whole brain teaching to students response and creative character in learning Mathematics. *Jurnal Pendidikan Dan Pengajaran*, *50*(1), 10–19. https://doi.org/10.2139/ssrn.2948569.

Yanti, O. F., & Prahmana, R. C. I. (2017). Model Problem Based Learning, Guided Inquiry, dan kemampuan berpikir kritis matematis. *Jurnal Review Pembelajaran Matematika*, *2*(2), 120–130. https://doi.org/10.15642/jrpm.2017.2.2.120-130.

ISSN (print) 2685-7111 | ISSN (online) 2338-6061