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Blended Learning: Interests, Responsibilities, and Students' Metacognitive Abilities Using the Discovery Model

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Abstract. Metacognitive activities in the learning process will help students gain lasting memories and understanding. Students should be directed to achieve high competence through various innovative learning activities, one of which is by applying the discovery learning model. This study aims to describe the interests, learning responsibilities and metacognitive abilities of students through the discovery learning model based on blended learning. This study uses a mixed qualitative-quantitative approach with an embedded research design. The sample in this study were 50 students of class XI MIA at SMA Negeri 4 Jambi City who were selected using a purposive sampling technique. The data collection instruments used were learning interest and learning responsibility questionnaires, students' metacognitive ability tests, and interview sheets. The data will be analyzed qualitatively using miles and hubarman and quantitatively using descriptive statistics and inferential statistics. The inferential statistics performed consist of assumption tests (normality test, homogeneity test, and linearity test) and hypothesis testing (T test and correlation test). The results of this study indicate that there are significant differences between learning interest, learning responsibility, and metacognitive abilities of students in class XI MIA 1 and class XI MIA 2, with a significance value of 0.012 for student learning interest, then 0.010 for student learning responsibility, and 0.007 for students' metacognitive abilities. In addition, it is known that there is a significant relationship between the variables of student interest and the metacognitive abilities of class XI MIA students at SMA Negeri 4 Jambi City, which is equal to 0.000.
Keywords: interest in learning; responsibility for learning; metacognitive ability; discovery learning; blended learning.

Introduction

The success of learning can be known by looking at the achievement of the goals that have been set (Ristiyani & Bahriah, 2016; Fauzan et al., 2017; Mitchell & Manzo, 2018; Suardipa & Primayana, 2020). Learning objectives at the high school level based on the 2013 curriculum consist of 4 core competencies namely attitude, social, knowledge, and skills (Abbas et al., 2018; Dekhtyar et al., 2020; Vajak et al., 2021). Based on Permendikbud No. 21 of 2016 states that students at the secondary education level (SMA/Equivalent) must have knowledge of competence, apply, analyze, and evaluate metacognition at the technical, specific, detailed, and complex levels to solve problems.

Therefore, one of the most important knowledge competencies for students at the high school level is metacognitive ability (Herlianti, 2015; Zakyah, et al., 2018; Santosa, 2021).

Metacognitive ability is the ability that a person has in controlling his learning process, starting from the planning stage, choosing the right strategy according to the problem at hand, then monitoring progress in learning, and analyzing the effectiveness of the chosen strategy (Iskandar, 2014; Novita, et al., 2018; Indira, et al., 2020). Metacognition is also defined as a form of ability to look at oneself so that what is done can be controlled optimally (Iskandar, 2016; Lestari, et al., 2019; Lewis, 2019). Students with metacognitive knowledge are aware of their strengths and limitations in learning. This means that when students know their mistakes, they are aware to admit that they are wrong, and try to correct them. Metacognition is classified as a high-level cognitive ability because it contains elements of analysis, synthesis, and evaluation as the forerunner to the growth and development of inquiry and creativity abilities (Al-Siyam, 2014; Agati, et al., 2019). Therefore, the implementation of learning should familiarize students to practice their metacognitive abilities. Metacognitive activities will assist students in obtaining long-lasting learning in students' memories and understanding (Iskandar, 2016; Jayanti, et al., 2019; Muhali, et al., 2021). Students should be directed to achieve high competence through various innovative learning activities, one of which is by applying the discovery learning model.

The discovery learning model aims to train students in finding concepts or theories that are relevant to the subject matter (Dalgarno et al., 2014; Janssen, et al., 2014; Salmi, 2019; Meishanti, et al., 2020). The concept of a discovery learning model in which students build their own knowledge through experiments carried out (Irmi, 2018; Puspitasari & Nurhayati, 2019; Sartika et al., 2020; Yuliani et al., 2021). The strength of the discovery learning model is that it can provide a learning experience for students, provide more learning opportunities, increase collaboration, increase student creativity, and increase student confidence (Naibaho & Hoesein, 2021). This discovery model is recommended to be applied in learning because it can shape knowledge, social behavior, develop curiosity, and train students' metacognitive abilities, especially in implementing blended online. Students' metacognitive abilities must be continuously trained and a high interest and responsibility in learning is needed in an effort to train their metacognitive abilities.

Interest in learning is the driving force from within a person to carry out learning activities to increase knowledge and skills and experience (Riyanti, 2022). Interest grows because of the desire to know and understand something to encourage and direct students' learning interest so that they are more serious in the learning process. Activities that a person is interested in, pay attention to continuously accompanied by a sense of pleasure so that he feels a sense of responsibility in learning. Students have a personal responsibility to take part in learning activities at school properly (Aydın et al., 2018; Elviana, 2017). The character of responsibility is very important for students to have, because it is needed when carrying out tasks given by the teacher (Lestariningsih & Suardiman, 2017). Responsibility often refers to the relationship between the individual and the surrounding environment (Boudlaie et al., 2020; Kalichman, 2014). Responsible people will be firm and courageous in making decisions and ready to take risks (Hidayati et al., 2018). If students can be responsible for themselves and be responsible for the tasks given then student achievement will increase (Hastuti et al., 2019; Syafitri, 2017). It is a process and can be learned from preschool age and will develop with age. One of the learning materials that requires high learning interest and responsibility, especially in

the application of discovery learning to train students' metacognitive abilities is the chemical material on salt hydrolysis.

The chemistry of salt hydrolysis is studied by students at the high school level. Chemical material about salt hydrolysis is a difficult concept for high school students (Irawati, 2019). There are many chemical concepts that require a fairly high level of understanding, based on the fact in the field that students' conceptual understanding is much lower than algorithmic understanding. Students tend to be able to solve or solve calculation problems compared to conceptual problems that underlie the formulas used in calculation problems (Nusi et al., 2021). Therefore, solving problems related to salt hydrolysis requires high learning interest and responsibility with good metacognitive abilities in order to understand the concept of salt hydrolysis material.

Research related to students' metacognitive abilities was carried out by Lestari, et al., in 2019 with the results of their research, namely the implementation of an *open-ended approach* in the learning process is very much needed in stimulating students' metacognitive abilities in thinking. The difference between the research of Lestari, et al., (2019) and this research is in the approach used, where this study uses a discovery learning approach to blended learning while Lestari, et al., (2019) uses an open-ended approach. Another difference is that this study examines the variables of interest in learning, learning responsibility, and students' metacognitive abilities which were not carried out by Lestari, et al., (2019). Furthermore, other research that is also relevant to this research was conducted by Ilma et al., (2021) concerning student learning persistence with the results of his research that there were differences in the high and low influence of students' physics learning persistence on students' cognitive learning outcomes. The difference between this study and that of Ilma et al., (2021) is in the materials used, where this study examines the chemistry of salt hydrolysis, while Ilma et al., (2021) examines the physics of Newton's laws. Another difference lies in the variables studied and also in the learning model applied.

Based on the relevant studies above and the absence of previous research that examines the relationship between the three variables, namely interest, responsibility, and metacognitive ability variables, the researcher is interested in conducting this research as an effort to fill in the gaps that exist in previous studies. The research objectives to be achieved by researchers are as follows:

1. To find out the differences in students' learning interests and responsibilities between class XI MIA 1 and class XI MIA 2.
2. To find out the differences in the cognitive abilities of students in class XI MIA 1 and class XI MIA 2.
3. To determine the relationship between interest in learning and the cognitive abilities of class XI students.

Methods

The research approach used by the researcher is a mixed qualitative-quantitative approach (mix method). The mixed method approach is a method that combines qualitative and quantitative approaches in terms of methodologies such as in the data collection stage. The research design used is embedded design. This design is used because the researcher inserts qualitative data to support quantitative data. Insertion is carried out on the part that requires strengthening or affirmation, so that the resulting conclusion has a better level of confidence (Ningsih, 2020; Santosa, 2021; Indiasari, 2022). The research activity begins with preparing research data collection instruments followed by the determination of research samples obtained based on sample selection techniques. Data collection instruments that have been prepared will be given to the

research sample and the data collected is analyzed according to the type of instrument used.

The instruments used by the researcher were a learning interest questionnaire and a student learning responsibility questionnaire, metacognitive ability test questions, and interview sheets. The student learning interest questionnaire used consisted of 16 statements and the student learning responsibility questionnaire consisted of 25 statements with 4 Likert scale answer choices from 1 to 4. Score 1 means very bad, score 2 means not good, score 3 means good, and score 4 means very good (Kholilah, et al., 2020; Fitriani, et al., 2021; Rini, et al., 2021; Putri, et al., 2021). The student learning interest questionnaire grid can be seen in Table 1.

Table 1. Questionnaire of Learning Interest and Student Learning Responsibilities

Variable	Indicator	Item Number
Learning Interest	Interest	1,2,3,4
	Attention	5,6,7
	Feeling happy	8,9,10,11
	Knowledge	12,13,14
	student engagement	15,16
Learning Responsibilities	Carry out obligations	1,2,3,4,5,6,7,8,9,10
	Do group assignments together	11,12,13,14,15
	Responsible for every action	16,17,18,19,20,21, 22,23,24,25

Table 1 shows the score categories of the Likert scale student learning interest and responsibility questionnaire consisting of very good, good, not good, and very bad categories. Furthermore, the instrument for testing students' metacognitive abilities in chemistry learning about salt hydrolysis using discovery learning consists of 5 essay questions with a score scale of 1 to 20. The grid of the test instruments used can be seen in Table 2.

Table 2. Grid of Students' Metacognitive Ability Test Instruments

Question Indicator	Question Number
Write down the hydrolysis reaction of salt and identify the acidic and basic properties of some salt solutions in water	1
Determine the type and properties of the salt that undergoes hydrolysis through observational data	2
Describe a salt that undergoes partial and total hydrolysis	3
State the relationship between the hydrolysis constant (Kh), the ionization constant of water (Kw) and the concentration of OH^- or H^+ of the hydrolyzed salt solution.	4
Calculating the pH of a hydrolyzed salt solution	5

Table 3 is a grid of students' metacognitive ability test instruments consisting of 5 questions. As for the category of scores of the Likert scale, students' metacognitive ability test instruments can be seen in Table 3.

Table 3. Categories of Likert Scale Scores for Students' Metacognitive Ability Test

Number	interval	Category
1	00.00 – 25.00	Not very good
2	25.01 – 50.00	not good
3	50.01 – 75.00	good
4	75.01 – 100.00	very good

Table 3, shows the categories of the Likert scale scores of the students' metacognitive ability test instrument consisting of very good, good, not good, and very bad categories. After the researcher prepared a student persistence questionnaire and metacognitive ability test questions, the researcher also prepared an interview sheet for 10 students with 10 questions. This interview aims to deepen the students' learning persistence and metacognitive abilities. The interview grid used can be seen in Table 4.

Table 4. Interview Instrument Grid

No	Component	Sub Component	Interview Sheet Number
1	Student learning responses to learning salt hydrolysis using the discovery model	a. Students' interests and responsibilities in learning chemistry about salt hydrolysis	1,5,7
		b. Student attitudes that arise when applying the discovery learning model	2,3,10
2	Students' metacognitive abilities in salt hydrolysis learning using the discovery learning model	a. Students are easier to work on test questions in salt hydrolysis learning with discovery learning learning models	4
		b. Students study in groups	6,9
		c. Students dare to ask questions to educators and friends	8

All instruments that have been prepared by the researcher will be given to the research sample which is considered representative of the population. The population in this study were all students of class XI SMA Negeri 4 Jambi City. There were 50 students as samples in this study who were selected using purposive sampling technique, namely 25 students of class XI MIA 1 and 25 students of class XI MIA 2. Purposive sampling is one of the sampling techniques, where the researcher determines the sample with certain considerations (Sugiyono, 2015; Fitriani, et al., 2020). The researcher's considerations in determining the sample are adjusted to the needs of the researcher based on the goals that have been set (Maharani & Bernard, 2018). The researcher's consideration in taking the sample is the class XI students who have studied the material of salt hydrolysis. After determining the research sample, all samples will be given data collection instruments in the form of questionnaires, test questions, and interviews are carried out for further data analysis.

The data will be analyzed according to the type of data used. For the data from the interview, a qualitative analysis was carried out using the Miles and Hubarman technique. Miles and Hubarman technique consists of 3 main activities, namely reducing data, presenting data, and making conclusions/verification (Andani & Yulian, 2018; Fitriani, et al., 2020). While the quantitative data in the form of a questionnaire of interest and responsibility for learning as well as test questions for students' metacognitive abilities were analyzed using descriptive statistics and inferential statistics. Quantitative data on descriptive statistics were analyzed to find average, percentage, minimum, and maximum values (Lasmawan, 2015; Monárrez et al., 2018; Fitriani, et al., 2021; Fitriani, et al., 2021). The search for the average value was carried out to describe the differences in the level of interest and responsibility in learning for students of class XI MIA 1 and students of class XI MIA 2, as well as to describe differences in the metacognitive abilities of students of class XI MIA 1 and the metacognitive abilities of students of class XI MIA 2.

Meanwhile, the analysis of inferential statistical data was carried out by using assumption tests and hypothesis testing. The assumption test carried out consists of Shapiro-Wilk normality test and homogeneity test Levene's Test of Equality of Error Variances homogeneity (Tanti et al., 2022). The normality test, homogeneity test, and linearity test used a significance level of 0.05. The data are normal, homogeneous, and linear if the significance value is > 0.05 and the data is not normal, not linear, and not homogeneous if the significance value is < 0.05 (Sulman, et al. 2015). After the data is normally distributed, homogeneous, and linear, the researcher then performs an inferential statistical analysis using the T test and correlation test. The T-test was conducted to see differences in students' learning interests and responsibilities and differences in metacognitive abilities of students in class XI MIA 1 and class XI MIA 2. A research data is said to have a difference if a significance value <0.05 is obtained and there is no difference if a significance value > 0.05 is obtained. 0.05. The correlation test was carried out to see the relationship between students' learning interest and the metacognitive abilities of SMA Negeri 4 Jambi City students. A research data is said to have a relationship between variables if it obtains a significance value of < 0.05 and has no relationship between variables if it obtains a significance value of > 0.05.

Results and Discussion

Based on the results of quantitative data analysis using descriptive statistics with the help of the IBM SPSS 23 program for questionnaires on students' learning interests and responsibilities as well as tests of students' metacognitive abilities, the following results are obtained.

Table 5. Description Results of Interest Questionnaire, Study Responsibility and Metacognitive Ability Test Questions for Class XI MIA 1 Students

Instrument	Category	f	Percentage of students	mean	min	max
Learning Perseverance Questionnaire	Not very good	0	0	57.22	40.00	64.00
	not good	3	12			
	good	9	36			
	very good	13	52			
Learning	Not very good	0	0	85.10	50.00	95.00
	not good	3	12			

Responsibilities Questionnaire	good	10	40			
	very good	12	48			
Metacognitive Ability Test	Not very good	0	0	87.20	49.00	100.00
	not good	4	16			
	good	9	36			
	very good	12	48			

Based on the descriptive results in Table 5 it can be seen that the learning interest of class XI MIA 1 students is more dominant in the very good category with a percentage of 52%, namely 13 students. By obtaining an average score of student learning interest of 56.72, a minimum score of 40.00, and a maximum score of 64.00. For the learning responsibility of class XI MIA 1 students, the dominance is in the very good category with an average of 48%, namely 12 students. By obtaining an average score of student learning interest of 85.10, a minimum score of 50.00, and a maximum score of 95.00. While students' metacognitive abilities obtained the largest percentage, namely 48% with a very good category of 12 students. By obtaining an average score of students' metacognitive abilities of 87.20, a minimum score of 49.00, and a maximum score of 100.00. Furthermore, the results of a questionnaire describing learning interest, learning responsibility, and metacognitive abilities of class XI MIA 1 students in chemistry learning about salt hydrolysis are presented in Table 6.

Table 6. Description Results of Interest Questionnaire, Study Responsibility and Metacognitive Ability Test Questions for Class XI MIA 2 Students

Instrument	Category	f	Percentage of students	mean	min	max
Learning Perseverance Questionnaire	Not very good	1	4	53.16	28.00	64.00
	not good	5	20			
	good	8	32			
	very good	11	44			
Learning Responsibilities Questionnaire	Not very good	0	0	83.00	46.00	97.00
	not good	3	12			
	good	11	44			
	very good	11	44			
Metacognitive Ability Test	Not very good	0	0	84.20	45.00	100.00
	not good	4	16			
	good	11	44			
	very good	10	40			

Based on the descriptive results in Table 6 it can be seen that the interest and responsibility for learning in class XI MIA 2 is more dominant in the very good category with the same percentage of 44%, namely 11 students. With the acquisition of an average score of student learning interest of 53.16, a minimum score of 28.00, and a maximum score of 64.00. As for the average score of student learning responsibility of 46.00, and a maximum score of 97.00. Meanwhile, the dominant students' metacognitive abilities were in the good category with a percentage of 44%, namely 11 students. By obtaining an average score of students' metacognitive abilities of 84.20, a minimum score of 45.00, and a maximum score of 100. Furthermore, for inferential statistical tests through assumption tests (normality test, homogeneity test, and linearity test) on interest questionnaires, learning responsibilities, and students' metagnitive abilities were also analyzed using the SPSS 23 program. The results of the assumption test on the normality test obtained the following results.

Table 7. Normality Test of Student Learning Interest Questionnaire, Student Learning Responsibilities, and Students' Metacognitive Abilities in Chemistry Learning About Salt Hydrolysis

Class	Instrument	Shapiro-Wilk		
		Statistics	df	Sig
XIA MIA 1	Learning Perseverance Questionnaire	0.890	25	0.154
	Student Learning Responsibilities	0.762	25	0.119
	Metacognitive Ability Test	0.926	25	0.069
XI MIA 2	Learning Perseverance Questionnaire	0.893	25	0.187
	Student Learning Responsibilities	0.862	25	0.136
	Metacognitive Ability Test	0.924	25	0.063

Normality test aims to determine whether the data is normally distributed or not. a data is normally distributed if it gets a significance value > 0.05 and the data is not normally distributed if it gets data < 0.05 (Putri et al., 2021). Based on table 8, the significance value of the XI MIA 1 class student interest questionnaire is 0.154 and XIA MIA 2 class is 0.187. For the learning responsibility questionnaire for class XI MIA 1 students it was 0.119 and for class XIA MIA 2 it was 0.136. Furthermore, for the metacognitive ability test for class XI MIA 1 students, a significance value of 0.069 was obtained and for class XI MIA 2, a significance value of 0.063 was obtained. Thus, because all data obtained a significance value of > 0.05, all data is normally distributed. Furthermore, the results of the second assumption test, namely the homogeneity test of interest questionnaire data, learning responsibilities and students' metacognitive abilities in chemistry learning about salt hydrolysis can be seen in Table 8.

Table 8. Homogeneity Test of Interest Questionnaire, Student Learning Responsibilities and Metacognitive Ability in Chemistry Learning About Salt Hydrolysis

Instrument	Statistical Levene	df1	df2	Sig.
Learning Perseverance Questionnaire	0.005	1	48	0.933
Student Learning Responsibilities	0.0004	1	48	0.899
Metacognitive Ability Test	0.004	1	48	0.952

Based on Table 8, the significance value of the student interest questionnaire was 0.933, the significance value of the student learning responsibility questionnaire was 0.899, and the students' metacognitive ability test obtained a significance value of 0.952. Because all data obtained a significance value of > 0.05, then all data is homogeneous. Furthermore, the results of the third assumption test, namely the linearity test of interest questionnaire data, learning responsibilities and students' metacognitive abilities in chemistry learning about salt hydrolysis can be seen in Table 9.

Table 9. Interest Questionnaire Linearity Test, Student Learning Responsibilities and Metacognitive Ability in Chemistry Learning About Salt Hydrolysis

Class				df	Sig
XI MIA 1	Questionnaire * Test	Between Groups	Deviationfrom Linearity	6	0.294
XI MIA 2	Questionnaire * Test	Between Groups	Deviationfrom Linearity	4	0.324

Linearity test aims to determine whether a data is linear or not. If a significance value > 0.05 is obtained, the data has a linear relationship and if a significance value is < 0.05, the data does not have a linear relationship (Syiarah et al., 2021). Based on table 10 the significance value of the interest questionnaire, learning responsibility and metacognitive ability tests for students of class XI MIA 1 is 0.294 and for students of class XI MIA 2 the significance value of the questionnaires of interest, learning responsibility and students' metacognitive ability tests is 0.324. Because all data obtained a significance value of > 0.05, then all data is linear. Because the assumption test conditions have been fulfilled, the data analysis can be continued with hypothesis testing, namely the T test to see differences in learning interest, learning responsibility and metacognitive abilities of students in class XI MIA 1 and class XI MIA 2. Following are the results of the T test between the interests of class XI students MIA 1 and XI MIA 2, the responsibilities of students in class XI MIA 1 and XI MIA 2, and the metacognitive abilities of students in class XI MIA 1 and XI MIA 2 in learning chemistry about salt hydrolysis can be seen in Table 10.

Table 10. T-Test Results Questionnaires of Interest, Responsibility, and Test Questions for Students' Metacognitive Ability in Chemistry Learning About Salt Hydrolysis

Instrument		df	Sig.(2-tailed)
Learning Perseverance Questionnaire	Equal variances assumed	48	0.012
	Equal variances not assumed	35,456	0.012
Student Learning Responsibilities	Equal variances assumed	48	0.009
	Equal variances not assumed	34,634	0.009
Metacognitive Ability Test	Equal variances assumed	48	0.007
	Equal variances not assumed	34,901	0.007

The t-test aims to determine whether there is a significant difference between the learning interests of students of class XI MIA 1 and the learning interests of students of class XI MIA 2, whether there is a significant difference between the learning responsibilities of students of class XI MIA 1 and the learning responsibilities of students of class XI MIA 2, as well as to find out the differences in the metacognitive abilities of students in class XI MIA 1 and the persistence of students in class XI MIA 2. Based on Table 10, the significance value of the student's learning interest variable is 0.012, the significance value of the student's learning responsibility variable is 0.010, and for the student's metacognitive ability variable the significance value is 0.007. Because the significance value obtained is <0.005, it can be concluded that there is a significant difference between the learning interests of class X MIA 1 students and the learning interests of class XI MIA 2 students, there is a significant difference between the learning responsibilities of class X MIA 1 students and student learning responsibilities class XI MIA 2, and there is a significant difference between the metacognitive abilities of class X MIA 1 students and the metacognitive abilities of class XI MIA2. Furthermore, a hypothesis test was carried out, namely a correlation test to see the relationship between the two variables, namely students' learning interest and students' metacognitive abilities. Following are the results of the correlation test between students' learning interest and students' metacognitive abilities in learning chemistry about salt hydrolysis which can be seen in Table 11.

Table 11. Correlation Test of Students' Learning Interests with Students' Metacognitive Abilities in Chemistry Learning About Salt Hydrolysis

Instrument		f	%
Ability Test Students' Learning Interests	Pearson Correlation	1	0.890**
	Sig. (2-tailed)		0.000
	N	50	50
Ability Test Metacognitive	Pearson Correlation	0.890**	1
	Sig. (2-tailed)	0.000	
	N	50	50

The correlation test aims to determine the relationship between learning interest and students' learning abilities in learning chemistry about salt hydrolysis. If the significance value is < 0.005 then there is a correlation between the two variables, but if the significance value is > 0.005 then there is no correlation between the two variables. Based on Table 11, a significance value of 0.000 <0.005 is obtained, so it can be concluded that there is a significant relationship between the variables of student interest in learning and the metacognitive abilities of class XI students at SMA Negeri 4 Jambi City. After the quantitative data were analyzed, the researcher then analyzed the qualitative data from the results of the interviews that had been conducted according to the prepared grid. Processed interview results are presented as follows.

Based on the results of the interviews, it is known that students' interest and responsibility in learning chemistry about salt hydrolysis, namely students are more diligent, interested and their sense of responsibility for learning increases, while the results of the interviews are:

> *"I feel that I am more diligent in studying chemistry about salt hydrolysis due to the use of the discovery learning model so that I am more active in asking questions, discussing and collaborating with group mates and my interest and learning responsibilities continue to increase so that it is easier for me to do it to understand chemical material about salt hydrolysis".*

Based on the results of interviews, it is known that students give a good attitude during the learning process using the discovery learning model, As for the results of the interview, namely:

> *"The use of the discovery learning model in blended learning chemistry about salt hydrolysis makes me more active and so enthusiastic in learning chemistry that I feel more diligent and my metacognitive abilities increase with the test questions given in learning about salt hydrolysis.*

Through interviews, it was also known that students became easier to understand and able to answer questions given about salt hydrolysis because of the application of the discovery learning model in chemistry learning. with the results of the interview, namely:

> *"I am able to answer questions about salt hydrolysis correctly and correctly after learning using the discovery learning model because I understand the meaning of the questions given and know the answers".*

Furthermore, based on the results of interviews with students, it is known that students' abilities are getting better in working together in groups to solve problems given to the salt hydrolysis material when doing learning using the discovery learning model, while the results of the interviews are:

> *"My group and I discussed together to discuss the right solution in solving a problem on salt hyrolysis material using the PBL model of discovery learning learning".*

In addition, it is also known that students are increasingly trained in their courage to express their opinions in discussions either to friends or teachers in learning chemistry about salt hydrolysis using the discovery learning model, as for the results of the interviews. that is:

> *"I dare to express my opinion when discussing with my friends and I dare to ask the teacher regarding the material being studied to find solutions to the problems given in salt hydrolysis learning material because of the application of the discovery learning model in chemistry learning".*

Interest in learning, learning responsibility and students' metacognitive abilities are three things that can be interrelated. Based on the descriptive results in Tables 6 and 7, it can be seen that students' interest in learning the salt hydrolysis chemistry of class XI MIA 1 is slightly superior to the learning interest of students in class XIA MIA 2 with an

average of 57.22 for class XI MIA 1 and class XI MIA 2 of 53.16. This can happen because 52% of class XI MIA 1 students answered the questionnaire in a very good category. Then, for student learning responsibilities in learning salt hydrolysis chemistry class XI MIA 1 is also slightly superior to the learning responsibilities of class XIA MIA 2 with an average of 85.10 for class XI MIA 1 and class XI MIA 2 of 83.00 .

Whereas in the metacognitive abilities of class XI MIA 1 students also obtained a higher average score than class XI MIA 2, namely 87.20 with a percentage of 48% in the very good category. This can happen because class XI MIA 1 answers more questions with higher scores than class XI MIA 2. Students' interest in learning, learning responsibility, and metacognitive abilities are also high because students in class XIA MIA 1 contain students with interests, responsibilities learning and enthusiasm for learning is high compared to class XI MIA 2, so the metacognitive abilities possessed by class XI MIA 1 are also in the very good category, with enthusiasm and independence to be able to answer the questions given correctly. With metacognitive abilities, it is expected that students can play an important role in solving problems and students are more skilled in solving problems within the framework of problem solving (Yunanti, 2016).

After the descriptive analysis was carried out, the researcher continued with the statistical analysis of inferential assumptions and found that all data from the interest in learning questionnaire, the learning responsibility questionnaire, and the metacognitive ability test instruments for students in class XIA MIA 1 and class XI MIA 2 obtained a significance value greater than 0.05 so that all data obtained is normal, homogeneous, and linear. After all the assumption test conditions are met, then a hypothesis test is carried out, namely the T test and correlation test. In the T test, a significance value of 0.012 was obtained in the student learning interest questionnaire, then 0.010 for student learning responsibility, and for students' metacognitive abilities, a significance value of 0.007 was obtained. Because the significance value obtained is <0.005, it can be concluded that there is a significant difference between the learning interests of class XI MIA 1 students and the learning interests of class XI MIA 2 students, there is a significant difference between the learning responsibilities of class XI MIA 1 students and the learning responsibilities of students class XI MIA 2, and there is a significant difference between the metacognitive abilities of students in class XI MIA 1 and the metacognitive abilities of students in class XI MIA 2. The smaller the significance value obtained (Sig. <0.05), the more varied or there are significant differences the results of the data obtained. Furthermore, for the correlation test, a significance value of 0.000 was obtained. Because the significance value obtained is <0.005, it can be concluded that there is a significant relationship between the variables of student learning interest and the metacognitive abilities of class XI students at SMA Negeri 4 Jambi City.

The results of this study are relevant to the research conducted by Sihaloho et al., (2018) who both studied students' metacognitive abilities. Where in this study students' metacognitive abilities were associated with student learning persistence. The results showed that there was a significant relationship between students' metacognitive abilities and student learning persistence. Meanwhile, the results of the research by Sihaloho et al., (2018) which examined students' metacognitive abilities with students' self-efficacy showed that the two variables had a positive and significant influence. Based on the results of the research that has been done, the teacher should pay attention to the metacognitive level of students which is adjusted to the learning method applied by the teacher in the learning process. For students who have low learning outcomes, it is better to pay more attention to preparation or lesson plans and learning strategies that are in accordance with their abilities, as well as to improve, review and re-evaluate their learning activities on a regular basis.

The learning process will greatly determine the learning achievement that will be obtained by students. The learning process is defined as an interaction between a teacher

and students (Pane & Dasopang, 2017; Jayul & Irwanto, 2020). The success of a learning can be seen from the achievement of one's learning competence which is the goal of a curriculum (Pantic & Wubbels, 2012; Unlu, 2018; Syahrial et al., 2019). Therefore, it is very necessary for students to have an active role in learning by applying various knowledge they have, and exploring concepts (Kazempour, 2014). Because this can affect student achievement. This is supported by the opinion of Alfiyah & Siswono (2014) which states that the success of students in learning, especially in problem solving, among others, depends on their awareness of what they know and how to do it. This awareness is called metacognition.

Metacognition is a person's knowledge and awareness about the thought process and his ability to control that process (Bulu, et al., 2015). This ability is very important, especially for the purposes of efficient use of cognitive in solving problems. Students who have good metacognitive abilities in solving problems will also have a good impact on their learning achievement. Metacognitive activities during learning, will assist students in obtaining long-lasting learning in students' memory and understanding (Iskandar, 2016; Ardana & Suryawan, 2019; Muhali, et al., 2021). Students' metacognitive abilities can be trained with interest, and good learning responsibility from students. The better the level of interest in learning and student learning responsibility, the metacognitive abilities will also increase. As in the results of this study, students' interest in learning has a significant correlation with students' metacognitive abilities. This is also supported by the results of the interviews that students are more diligent in learning by using the discovery learning model so that they can improve students' metacognitive abilities in learning chemistry about salt hydrolysis.

Interest in learning is the driving force from within a person to carry out learning activities to increase knowledge and skills and experience (Riyanti, 2022). Interest grows because of the desire to know and understand something to encourage and direct students' learning interest so that they are more serious in the learning process. Activities that a person is interested in, pay attention to continuously accompanied by a sense of pleasure so that he feels a sense of responsibility in learning. Students have a personal responsibility to take part in learning activities at school properly (Aydın et al., 2018; Elviana, 2017). The character of responsibility is very important for students to have, because it is needed when carrying out tasks given by the teacher (Lestariningsih & Suardiman, 2017). Responsibility often refers to the relationship between the individual and the surrounding environment (Boudlaie et al., 2020; Kalichman, 2014). Responsible people will be firm and courageous in making decisions and ready to take risks (Hidayati et al., 2018). If students can be responsible for themselves and be responsible for the tasks given then student achievement will increase (Hastuti et al., 2019; Syafitri, 2017). It is a process and can be learned from preschool age and will develop with age.

Research related to students' metacognitive abilities was conducted by Muna in 2017. The results showed that there was a significant positive correlation between student achievement goals and metacognitive abilities in solving chemical problems about chemical equilibrium, with a correlation value (r) obtained of +0.516. Students with achievement goals will focus on learning with their metacognitive abilities. The difference between this study and Muna's (2017) research is in the chemical material studied, in this study the researcher studied the chemical material about salt hydrolysis, while Muna (2017) studied the chemical material about chemical equilibrium. Another difference is in the research variables studied, in Muna's research (2017) the variables studied were metacognitive abilities and student achievement goals, while in this study the variables studied were learning interest, learning responsibility and students' metacognitive abilities in applying blended learning using discovery method. Through the results of this study it will be known how students' metacognitive abilities correlate with students' learning interests.

By knowing persistence and its relationship with students' metacognitive abilities in blended learning using the discovery model, it will be known how effectively a model is applied. So that it will improve the quality of learning outcomes and in the future someone can apply their knowledge to others, especially as a prospective future educator of the nation who will participate in educating the nation's children. The results of this study are expected to be used as a source of knowledge and a reference for further research with the provided updates.

Conclusion

The use of the discovery model in belended learning-based learning will have an impact on students' interests, learning responsibilities, and metacognitive abilities. The use of discovery learning models is recommended to be applied in learning because it can provide learning experiences for students, provide more learning opportunities, increase collaboration, increase student creativity, and increase student confidence. Based on the results of the study it can be concluded that there is a significant difference between learning interest, learning responsibility, and metacognitive abilities of students in class XI MIA 1 and class XI MIA 2, with a significance value of 0.012 for student learning interest, then 0.010 for student learning responsibility, and students' metacognitive abilities obtained a significance value of 0.007. In addition, it is known that there is a significant relationship between the variables of student learning interest and the metacognitive abilities of class XI students of SMA Negeri 4 Jambi City, which is equal to 0.000.

References

Abbas, N., Ashiq, U., & Abrar, U.M. 2018. Gap between acquired and required English learning objectives for the primary school students: Empirical evidence from Sargodha (Pakistan). *Cogent Social Sciences*, 4(1):1–16. https://doi.org/10.1080/ 23311886. 2018.1457421.

Agati, F., Hasruddin, & Hasibuan, I. 2019. Analisis keterampilan metakognitif siswa pada pembelajaran saintifik materi keanekaragaman hayati. *Jurnal Pelita Pendidikan*, 7(1):23–27. https://doi.org/http://dx.doi.org/10.30870/educhemia.v7i2.

Al-Siyam, E. 2014. Perbandingan kemampuan pemahaman matematika antara siswa yang mendapatkan pembelajaran contextual teaching and learning (CTL) dan metakognitif. *Jurnal Pendidikan Matematika*, 3(1):55–66. https://journal.institut-pendidikan.ac.id/index.php/mosharafa/article/view/mv3n1_6.

Alfiyah. N. & Siswono. T.Y.E. 2014. Identifikasi kesulitan metakognisi siswa dalam memecahkan masalah matematika. *MATHEdunesa*, 3(2):131–138. https://doi.org/ 10.26740/mathedunesa.v3n2.

Andani, D.T. & Yulian, M. 2018. Pengembangan bahan ajar electronic book menggunakan software Kvisoft flipbook pada materi hukum dasar kimia di SMA Negeri 1 Panton Reu Aceh Barat. *JIPI (Jurnal IPA & Pembelajaran IPA)*, 2(1):1–6. https://doi.org/10. 24815/jipi.v2i1.10730.

Aydın, U., Tunç-Pekkan, Z., Taylan, R.D., Birgili, B., & Özcan, M. 2018. Impacts of a university–school partnership on middle school students' fractional knowledge: A quasiexperimental study. *Journal of Educational Research*, 111(2):151–162.

https://doi.org/10.1080/00220671.2016.1220358.

Boudlaie, H., Keshavarz, N.B., & Kenarroodi, M. 2020. The impact of corporate social responsibility and internal marketing on employee turnover intentions with the mediating role of organizational commitment. *Technium Social Sciences Journal*, 4:121–134. https://doi.org/10.47577/tssj.v4i1.104.

Bulu, V.R., Budiyono, & Slamet, I. 2015. Kesulitan metakognisi siswa dalam memecahkan masalah matematika pada materi peluang ditinjau dari tipe kepribadian tipologi hippocrates – galenus kelas XI MIA 1 SMA Negeri I Soe. *Jurnal Elektronik Pembelajaran Matematika*, 3(9):970–984. http://www.jurnal.fkip.uns. ac. id/index.php/s2math.

Dalgarno, B., Kennedy, G., & Bennett, S. 2014. The impact of students' exploration strategies on discovery learning using computer-based simulations. *Educational Media International*, 51(4):310–329. https://doi.org/10.1080/09523987.2014. 977009.

Dekhtyar, M., Colford, C., Whisenant, E., Huber, J., Johnson, E., Thomas, P., Kirley, K., Mazzurco, L., Dingle, A.D., Terry, V., Rajasekaran, S., Barkowski, L., Kulkarni-Date, M., Henderson, D., & Wilkerson, L.A. 2020. Development of Learning objectives to guide enhancement of chronic disease prevention and management curricula in undergraduate medical education. *Teaching and Learning in Medicine*, 32(3):241–249. https://doi.org/10.1080/10401334.2020.1724791.

Elviana, P.S. 2017. Pembentukan sikap mandiri dantanggung jawab melalui penerapan metode sosiodrama dalam pembelajaran pendidikan kewarganegaraan. *Citizenship Jurnal Pancasila dan Kewarganegaraan*, 5(2):134-141. https://doi.org/10.25273/ citizenship.v5i2.1643.

Fauzan, M., Gani, A., & Syukri, M. 2017. Penerapan model problem based learning pada pembelajaran materi sistem tata surya untuk meningkatkan hasil belajar siswa. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, 5(1):27–35. https://jurnal.usk.ac.id/JPSI/issue/view/962.

Fitriani, R., Astalini, & Kurniawan, D.A. 2020. Studi ekploratif: pengembangan modul elektronik pada mata kuliah fisika matematika 1. *Al Ulum Sains dan Teknologi*, 7(1):1–9. https://doi.org/10.31602/ajst.v7i1.5462.

Fitriani, R., Kholilah, K., Rini, E.F.S., Pratiwi, M.R., Safitri, H., Syiarah, H., & Ramadhanti, A. 2021. Analisis karakter kerja keras siswa kelas XI IPA di SMAN 1 Kota Jambi. *Pendipa: Journal of Science Education*, 5(2):188–194. https://doi.org/10.33369/ pendipa.5.2.188-194.

Fitriani, R., Maryani, S., Chen, D., Aldila, F.T., Ginting, A.A., Sehab, N.H., & Wulandari, M. 2021. Mendeskripsikan keterampilan proses sains siswa melalui kegiatan praktikum viskositas di SMAN 1 Muaro Jambi. *Pendipa: Journal of Science Education*, 5(2):173–179. https://doi.org/10.33369/pendipa.5.2.173-179.

Fitriani, R., Putri, W. A., Rini, E.F.S., Sehab, N.H., & Pratiwi, M.R. 2021. Pengaruh kerja keras terhadap hasil belajar siswa IPA di SMAN 1 Kota Jambi. *SAP (Susunan Artikel Pendidikan)*, 5(3):213–220. https://doi.org/http://dx.doi.org/10.30998/sap.v5i3. 7750.

Hastuti, D.D., Sutama, S., & Fuadi, D. 2019. Tanggung jawab siswa dalam pembelajaran matematika SMA. *Manajemen Pendidikan*, 13(2):139–146. https://doi.org/10.23917/jmp.v13i2.7481.

Herlianti, Y. 2015. Senior high school students' metacognitive awareness and metacognitive knowledge in achieving the graduate standard. *Jurnal Cakrawala Pendidikan*, 34(3):357–367. https://doi.org/10.21831/cp.v3i3.7343.

Hidayati, K., Budiyono, & Sugiman. 2018. Development and validation of student's responsibility scale on mathematics learning using subject scaling model. *International Journal of Instruction*, 11(4):499–512. https://doi.org/10.12973/iji.2018.11431a.

Indiasari, M. 2022. Implementasi kemampuan menerapkan unsur mekanik dalam menulis teks eksplanasi dengan menggunakan model discovery learning dan dampaknya terhadap peningkatan kemampuan berpikir kritis peserta didik kelas XI di SMAN 1 Pasawahan Kabupaten Purwakarta. *Wistara*, 5(1):60–70. https://doi.org/10.17509/bs_jpbsp.v22i1.

Indira, S.M., Sundaryono, A., & Elvia, R. 2020. Pengembangan e-modul kimia berbasis metakognisi menggunakan aplikasi edmodo. *Alotrop*, 4(1):33–41. https://doi.org/10.33369/atp.v4i1.13707.

Irawati, R.K. 2019. Pengaruh pemahaman konsep asam basa terhadap konsep hidrolisis. *Thabiea: Journal of Natural Science Teaching*, 2(1):1–6. http://dx.doi.org/10.21043/thabiea.v2i1.

Irmi, I. 2018. Penerapan model discovery learning melalui game gets lucky pada materi hidrokarbon dan minyak bumi dalam peningkatan aktivitas dan hasil belajar siswa kelas XI MIPA 2 SMAN Unggul Aceh Timur. *JIPI (Jurnal IPA & Pembelajaran IPA)*, 2(1):15–20. https://doi.org/10.24815/jipi.v2i1.10741.

Iskandar, S.M. 2014. Pendekatan keterampilan metakognitif dalam pembelajaran sains di kelas. *Erudio Journal of Educational Innovation*, 2(2):13–20. https://doi.org/10.18551/erudio.2-2.3.

Iskandar, S.M. 2016. Pendekatan keterampilan metakognitif dalam pembelajaran sains di kelas. *Erudio Journal of Educational Innovation*, 2(2):13–20. https://scholar.google.com/scholar?hl=id&as_sdt=0%2C5&q=Iskandar%2C+S.+M.+%282016%29.+Pendekatan+keterampilan+metakognitif+dalam+pembelajaran+sains+di+kelas.+Erudio+Journal+of+Educational+Innovation%2C+2%282%29%2C+13–20.&btnG=.

Janssen, F.J., Westbroek, H.B., & Van-Driel, J.H. 2014. How to make guided discovery learning practical for student teachers. *Instructional Science*, 42(1):67–90. https://link.springer.com/article/10.1007/s11251-013-9296-z.

Jayanti, N.P.S., Ardana, I.M., & Suryawan, I.P.P. 2019. Pengaruh model pembelajaran improve berbantuan masalah terbuka terhadap kemampuan pemecahan masalah matematika siswa kelas VIII SMP Laboratorium Undiksha. *Jurnal Pendidikan Matematika Undiksha*, 10(2):9–18. https://doi.org/10.23887/jjpm.v10i2.19909.

Jayul, A. & Irwanto, E. 2020. Model pembelajaran daring sebagai alternatif proses kegiatan belajar pendidikan jasmani di tengah pandemi covid-19 Achmad. *Jurnal*

Pendidikan Kesehatan Rekreasi, 6(2):190–199. https://ojs.mahadewa.ac.id/index.php/jpkr/issue/view/53.

Kalichman, M. 2014. Rescuing Responsible conduct of research (RCR) Education. *Accountability in Research*, 21(1):68–83. https://doi.org/10.1080/08989621.2013.822271.

Kazempour, M. 2014. The interrelationship of science experiences, beliefs, attitudes, and self-efficacy: A case study of a pre-service teacher with positive science attitude and high science teaching self-efficacy. *European Journal of Science and Mathematics Education*, 1(3):106–124. https://doi.org/10.30935/scimath/9391.

Kholilah, Ramadhanti, A., Fitriani, R., Febri, E., & Pratiwi, M.R. 2020. Hubungan kerja keras dan hasil belajar fisika di SMA Negeri 1 Kota Jambi. *Journal of Science Education And Practice*, 4:41–48. https://journal.unpak.ac.id/index.php/jsep.

Lasmawan, W. 2015. Pengembangan perangkat pembelajaran e-learning mata kuliah wawasan pendidikan dasar, telaah kurikulum pendidikan dasar, pendidikian IPS Sekolah Dasar, perspektif global dan problematika pendidikan dasar. *JPI (Jurnal Pendidikan Indonesia)*, 4(1):556–570. https://doi.org/10.23887/jpi-undiksha.v4i1.4914.

Lestari, W., Selvia, F., & Layliyyah, R. 2019. Pendekatan open-ended terhadap kemampuan metakognitif siswa. *At-Ta'lim : Jurnal Pendidikan*, 5(2):184–197. https://doi.org/10.36835/attalim.v5i2.263.

Lestariningsih, N. & Suardiman, S.P. 2017. Pengembangan bahan ajar tematik-integratif berbasis kearifan lokal untuk meningkatkan karakter peduli dan tanggung jawab. *Jurnal Pendidikan Karakter*, 8(1):11-20. https://doi.org/10.21831/jpk.v7i1.15503.

Lewis, H. 2019. Supporting the development of young children's metacognition through the use of video-stimulated reflective dialogue. *Early Child Development and Care*, 189(11):1842–1858. https://doi.org/10.1080/03004430.2017.1417273.

Maharani, S. & Bernard, M. 2018. Analisis hubungan resiliensi matematik terhadap kemampuan pemecahan masalah siswa pada materi lingkaran. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 1(5):819–826. https://doi.org/10.22460/jpmi.v1i5.p819-826.

Meishanti, O.P.Y., Sholihah, F.N., & Dari, N.S.U. 2020. Implementasi discovery learning dengan praktikum kingdom plantae. *Biologi dan Pembelajarannya*, 7(2):36–43. http://ojs.unpkediri.ac.id/index.php/biologi/index.

Mitchell, K.M.W. & Manzo, W.R. 2018. The purpose and perception of learning objectives. *Journal of Political Science Education*, 14(4):456–472. https://doi.org/10.1080/15512169.2018.1433542.

Monárrez, A., Galvan, L., Wagler, A.E., & Lesser, L.M. 2018. Range of meanings: a sequential mixed methods study of how english language learners encounter assessment items on descriptive statistics. *Journal of Statistics Education*, 26(3):162–173. https://doi.org/10.1080/10691898.2018.1511388.

Muhali, M., Asy'ari, M., & Sukaisih, R. 2021. Model pembelajaran inquiry terbimbing terintegrasi laboratorium virtual untuk meningkatkan pemahaman konsep dan keterampilan metakognitif siswa. *Empiricism Journal*, 2(2):73–84. https://doi.org/10.36312/ej.v2i2.594.

Muna, K. 2017. Pengaruh tujuan berprestasi terhadap keterampilan metakognisi siswa dalam pemecahan masalah kimia (studi korelasional pada siswa XI IPA SMAN 2 Banjarmasin). *Quantum: Jurnal Inovasi Pendidikan Sains*, 8(1):89–98. https://ppjp.ulm.ac.id/journal/index.php/quantum/article/view/3862.

Naibaho, M.R.U. & Hoesein, E.R. 2021. Meta analisis model discovery learning untuk meningkatkan hasil belajar IPA siswa SD. *JPDI (Jurnal Pendidikan Dasar Indonesia)*, 6(1):19–25. https://doi.org/10.26737/jpdi.v6i1.2290.

Ningsih, E.F. 2020. Implementasi model pembelajaran search, solve, create and share (sscs) untuk meningkatkan kemampuan berpikir kreatif matematis dan dampaknya terhadap disposisi matematis siswa SMA. *Pasundan Journal of Mathematics Education Jurnal Pendidikan Matematika*, 5(1):20–32. https://doi.org/10.23969/pjme.v5i1.2519.

Novita, T., Widada, W., & Haji, S. 2018. Metakognisi siswa dalam pemecahan masalah matematika siswa sma dalam pembelajaran matematika berorientasi etnomatematika Rejang Lebong. *Jurnal Pendidikan Matematika Raflesia*, 3(1):41–54. https://ejournal.unib.ac.id/index.php/jpmr/article/view/6288.

Nusi, K., Laliyo, L.A.R., Suleman, N., & Abdullah, R. 2021. Hidrolisis garam description of s tudents ' conceptual understanding of salt hydrolysis material. *Quantum: Jurnal Inovasi Pendidikan Sains*, 12(1):118–127. https://id.search.yahoo.com/search?fr=mcafee&type=E210ID91215G0&p=quantum%3A.

Pane, A. & Dasopang, M.D. 2017. Belajar dan Pembelajaran. *Fitrah:Jurnal Kajian Ilmu-Ilmu Keislaman*, 3(2):315-333. https://doi.org/10.24952/fitrah.v3i2.945.

Pantic & Wubbels, T. 2012. Competence-based teacher eduation: A change from didaktik to curriculum culture. *Journal of Curriculum Studies*, 44:61–87. https://doi.org/10.1080/00220272.2011.620633.

Puspitasari, Y. & Nurhayati, S. 2019. Pengaruh model pembelajaran discovery learning terhadap hasil belajar siswa. *Jurnal Pendidikan dan Kewirausahaan*, 7(1):93–108. https://doi.org/10.47668/pkwu.v7i1.20.

Putri, W.A., Fitriani, R., Rini, E.F.S., Aldila, F.T., & Ratnawati, T. 2021. Pengaruh motivasi terhadap hasil belajar siswa Sekolah Menengah Pertama. *Jurnal Pembelajaran dan Matematika Sigma (JPMS)*, 7*(*1):7–11. https://doi.org/10.36987/jpms.v7i1.1942.

Rini, S.E.F., Fitriani, R., Matondang, M.M., Yolviansyah, F., Putri, N.D., Agatha, F.L., & Lolita, N. 2021. Pengaruh karakter kerja keras terhadap hasil belajar fisika di SMA Negeri 1 Kota Jambi. *Pendipa: Journal of Science Education*, 5(2):256–261. https://doi.org/10.33369/pendipa.5.2.256-261.

Ristiyani, E. & Bahriah, E.S. 2016. Analisis kesulitan belajar kimia siswa di SMAN X Kota Tangerang Selatan. *Jurnal Penelitian dan Pembelajaran IPA*, 2(1):18-27. https://doi.org/10.30870/jppi.v2i1.431.

Riyanti, E. 2022. Analisis proses pembelajaran model kooperatif tipe jigsaw pada materi hidrokarbon di SMAN 6 Kota Jambi. *Journal Evaluation in Education (JEE)*, 3(2):38–44. https://doi.org/10.37251/jee.v3i2.230.

Salmi. 2019. Penerapan model pembelajaran discovery learning dalam meningkatkan hasil belajar ekonomi peserta didik kelas XII IPS.2 SMA Negeri 13 Palembang. *Jurnal Profit*, 6(1):1–16. 10.36706/jp.v6i1.7865.

Santosa, A. 2021. Penerapan model kooperatif tipe teams games tournament berbasis media puzzle pada pembelajaran menulis teks prosedur untuk kelas VII SMP Al Falah Dago. *Wistara: Jurnal Pendidikan Bahasa dan Sastra*, 4(1):30–40. https://journal.unpas.ac.id/index.php/wistara/article/view/4396.

Sartika, R.P., Ariansyah, D., & Azhari, I. 2020. Deskripsi pemahaman konsep calon guru pada materi perancangan dan pembangunan laboratorium kimia menggunakan model discovery learning. *JIPI (Jurnal IPA & Pembelajaran IPA)*, 4(1):1–10. https://doi.org/10.24815/jipi.v4i1.15006.

Sihaloho, L., Rahayu, A., & Wibowo, L.A. 2018. Pengaruh metakognitif terhadap hasil belajar pada mata pelajaran ekonomi melalui efikasi diri siswa. *Jurnal Ekonomi Pendidikan dan Kewirausahaan*, 6(2):121–136. https://doi.org/10.26740/jepk.v6n2.p121-136.

Suardipa, I.P. & Primayana, K.H. 2020. Peran desain evaluasi pembelajaran untuk meningkatkan kualitas pembelajaran. *Widyacarya*, 4(2):88–100. http://jurnal.stahnmpukuturan.ac.id/index.php/widyacarya/article/view/796.

Sugiyono. 2015. *Metode Penelitian dan Pengembangan*. Alfabeta. https://opac.perpusnas.go.id/DetailOpac.aspx?id=996885.

Sulman, S., Adlim, A., & Ilyas, S. 2015. Peningkatan motivasi dan hasil belajar siswa smp pada materi getaran dan gelombang dengan menggunakan media tik slide powerpoint dan demonstrasi alat sederhana. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, 3(2):122–130. https://jurnal.usk.ac.id/JPSI/article/view/7701.

Syafitri, R. 2017. Meningkatkan tanggung jawab belajar melalui strategi giving questions and getting answers pada siswa. *Jurnal Penelitian dan Pengembangan Pendidikan*, 1(2):57–63. https://doi.org/10.23887/jppp.v1i2.12623.

Syahrial, S., Asrial, A., Kurniawan, D.A., & Pratama, R.A. 2019. Towards improving the critical thinking skills of pre-service teachers in Indonesia. *Journal of Education and Learning (EduLearn)*, 13(4):575–582. https://doi.org/10.11591/edulearn.v13i4.13613.

Syiarah, H., Novista, E.D., Agatha, F.L., Simamora, N.N., Safitri, H., & Fitriani, R. 2021. *Sebaran Tingkat Pemahaman Pembelajaran Fisika Kelas XI SMA Negeri 4 Kota Jambi*. 2:113–121. http://dx.doi.org/10.35580/jspf.v17i2.15673.

Tanti, Astalini, Darmaji, Kurniawan, D.A., & Fitriani, R. 2022. Student perception review from gender : electronic moduls of mathematical physics. *Jurnal Pendidikan Indonesia*, 11(1):125–132. https://ejournal.undiksha.ac.id/index.php/JPI/article/view/35107.

Unlu, S. 2018. Curriculum development study for teacher education supporting critical thinking. *Eurasia Journal Educational Research*, 76:165–186.

Vajak, M., Izadpanah, S., & Naserian, J. 2021. The assessment of intercultural competence in Iranian EFL and Non-EFL Leaners: Knowledge, skill, awareness, and attitude. *Cogent Education*, 8(1):1–14. https://doi.org/10.1080/2331186X.2021.1936885.

Yuliani, Y., Hasanuddin, H., Safrida, S., Khairil, K., & Pada, A.U.T. 2021. Implementasi model discovery learning dipadu modul sistem ekskresi berbasis konstruktivisme untuk meningkatkan keterampilan berpikir kritis peserta didik. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, 9(3):376–390. https://doi.org/10.24815/jpsi.v9i3.19965.

Yunanti, E. 2016. Hubungan antara kemampuan metakognitif dan motivasi belajar dengan hasil belajar biologi kelas IX MTs N Metro Tahun Pelajaran 2013/2014. *Bioedukasi (Jurnal Pendidikan Biologi)*, 7(2):81–89. https://doi.org/10.24127/bioedukasi.v7i2.609.

Zakyah, N., Tiro, M.A., & Side, S. 2018. Pengaruh kemampuan berpikir divergen, kemampuan metakognisi, dan efikasi diri terhadap kemampuan pemecahan masalah matematika siswa kelas Xi SMA Negeri di Kabupaten Bone. *Seminar Nasional Variansi 2018*, 1(1):97–109. http://103.76.50.195/variansistatistika/article/view/7200.