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The Effect of Guided Inquiry Model with Active-Reflective Dimensional Learning Style on High School Students' Chemistry Learning Outcomes

***Meida Esterlina Marpaung[1]**
Program Studi Pendidikan Kimia, FKIP, Universitas Tadulako, Indonesia[1]
*e-mail: chemistrymeida89@gmail.com

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Abstract

The mean values of MAN 2 Palu students on the topic of reaction rates in the last three years are low**.** The cause of low learning outcomes is learning that has not paid attention to students' average learning styles. The learning model used in this study is a guided inquiry model with an active dimensional learning style. The research sample selection technique was purposive sampling by taking into account the average student learning outcomes. The research samples were 27 students in class XI MIA6 as an experimental class, learning with the model and class XI MIA4 with 27 students as a class, learning with a guided inquiry control model. The stages of the research were identifying students' learning styles in the experimental class, applying the ITG-Dia model in chemistry learning by observing attitudes and skills activities and ending with giving an evaluation. The results of the learning style assistance were obtained by 8 students with an active dimension style which were then distributed to each group before learning was carried out. The results of the experimental class research obtained an average altitude of 84.26 (very good); skills of 79.42 (good); learning outcomes of 83; n-gain of 0.78 (high). Control class observations obtained an average altitude of 85.93 (very good); skills 79,79,56 (good); learning outcomes 60.78; n-gain 0.50 (medium). The results of the t-test statistical analysis obtained t 13.12 and t 1.67. The results of the statistical analysis showed that there were significant differences in student learning in the experimental class and the control class. Based on statistical analysis, it can be concluded that the application of the active-reflective dimensional model affects increases students' chemistry learning outcomes.

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INTRODUCTION

The average score for the National Examination (UN) for MAN 2 Palu City students in the last three years has been relatively low. In 2015 it only reached 33.69, the lowest score was 10 and the highest was 75 with a standard deviation of 14.88. In 2016 the average value was 41.26 and in 2017 it was 40.25 (MAN 2 Model Palu, 2017). The results of interviews with chemistry teachers in class XI obtained information on several topics that contributed to the low learning outcomes and grades of National Examination students, including the subject of reaction rate.

The results of students' low National Examination scores can provide an overview of students' weak mastery of concepts and critical thinking skills in chemistry material. This is thought to have something to do with the learning process, including learning the selection model. Learning models that do not train students to develop critical thinking skills result in low learning outcomes.

Guided inquiry-based learning involves students seeking information and making explanations from direct experience with teacher guidance. The learning stages of the inquiry model are finding problems, formulating ideas, designing experiments, conducting experiments, analyzing data and making conclusions. Inquiry learning is considered more meaningful because inquiry puts pressure on the development of cognitive, affective, and psychomotor aspects in a balanced way [1], several studies have shown that

this method is effective in improving student learning outcomes [2]. students [3].

Another factor suspected to be the cause of low learning outcomes is learning factors that do not pay attention to student learning styles. Learning style is the way we prefer to think, process and understand information [4]. Learning style is a combination of absorbing, organizing, and processing information. Also learning styles affect learning outcomes [5].

There are three types of learning styles, namely: visual, auditory, and kinesthetic. This grouping does not mean that each individual has only one learning style, but rather shows the dominant learning style that is owned by each student. It should be realized that not everyone has the same learning style. For this reason, teachers need to know student learning styles. Student learning styles can help teachers to apply appropriate learning materials for efficient learning [6]. If the teaching and learning styles and student learning styles do not match, the information conveyed tends to be rejected [7]. In line with this, it is important for teachers to combine their teaching style with student learning styles [8].

The guided inquiry learning model uses the active-reflective dimension learning style, which is a learning model that incorporates aspects of the active dimension learning style in each stage of inquiry learning [9]. The dimension of active learning style is a condition where students like the presentation of material that requires student activity in the learning process. The active-reflective dimension learning model influences students' chemistry learning outcomes [10]. Based on the results of this study, the active dimension learning model is applied to chemistry learning at school to determine its effect on student learning outcomes.

Research Methods

The stages in this research are as follows:

1. Planning stage
   1) The activities carried out at the planning stage are as follows:
   2) Determination of the research sample
   3) Design learning devices that will be used in research.

Making research instruments such as observation figures for teacher and student activities.

2. Implementation Stage

   The activities carried out at this stage are as follows:
   1) help assist students' learning styles using a learning style questionnaire.
   2) Validating learning tools, namely validating construction and content through expert validation.
   3) learning problems according to the specified scenario.
   4) Implementation of observing the activities of teachers and students in learning.
3. Evaluation Stage

   The activity carried out at this stage is to evaluate at the end of the lesson by providing learning outcomes.
4. Results Reporting Stage
   1) Collect all research data.
   2) Analyzing data and processing research data.
5. Population and Sample

This research was conducted in class XI MAN 2 Palu City. The research samples were students of class XI MIA6 as the experimental class and class XI MIA4 as the control class. Handling the research sample using purposive sampling, namely the average learning outcomes are the same.

Research Result

The design of this study used the pretest-posttest one group design, namely the research was conducted twice, namely before the experiment (pretest) and after the experiment (posttest) with one group of subjects [11]. The research design is presented in Table 1.

Table 3.1 Research Design

Group	*Pretest*	Treatment	*Posttest*
Experiment	O1	X1	O2
Control	O1	X2	O2

Data analysis technique

The research data analyzed device validation and analysis of student learning outcomes tests. The criterion used to decide that the developed tool has good validity is if the average expert judgment for each aspect (M) is in the

minimum criteria of good or M≥2.5 (Nurdin, 2007). Student learning outcomes through the application of the guided inquiry model with the active reflective dimension learning style are calculated based on the normalized gain using the formula developed by Hake (1999) as follows:

$$g = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}} \times 100$$

Hypothesis testing

Test the hypothesis using the convenience test of two averages. The hypothesis to be tested is:

Ho: μ1 = μ2 student learning outcomes following learning using ITG-Dia are the same as students taking learning using conventional models.

Ha: μ1≠μ2 The learning outcomes of students participating in learning using the ITG-Dia are different from the learning outcomes of students participating in learning using conventional models.

Validation of Learning Implementation Plans

The results of the expert validation of the RPP are presented in Table 2.

Table 2 Results of Expert Assessment and Validity Categories of the ITG-Dia Model RPP

NO	Rated aspect	LKPD Average Score and Category Validity					
		P1	P2	P3	P4	X	validity
1	Formulation of Objectives	3,40	3.50	3.75	3.80	3.61	SV
2	Material	3.65	3.70	3.70	3.70	3.69	SV
3	Language	3,40	3.60	3.80	3.80	3.65	SV
4	Time Allocation	3.54	3.70	3.80	3.80	3.71	SV
5	Learning Activities	3.45	3.80	3.80	3.90	3.74	SV

Information: P1, P2, P3, P4 = RPP1, 2, 3, 4; Assessment category: 1.00 – 199 = invalid (TV); 2.00 – 2.74 = less valid (KV); 2.75 -3.49 = valid (V); and 3.50 – 4.00 = very valid (SV)

The results of expert validation show that the lesson plans used are valid and can be used in research. Furthermore, empirical validation was carried out on research instruments in class XII students of MAN 2 Palu City. Of the 25 questions that were validated, 16 questions were declared valid and 9 questions were invalid. Questions that are declared valid are used in research.

3) The results help students' learning styles

This research involved 27 students of class XI MIA 6 consisting of 11 boys and 16 boys as an experimental class.

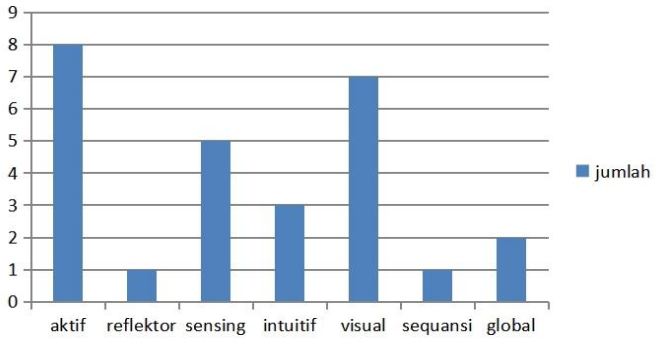

Figure 4. 1 Graph of Student Learning Styles

Figure 4.1 shows that the learning style of MIA6 class students is dominated by the active dimension of 29.63% and the visual dimension of 25.93%.

Table 3. Trends in student learning styles

Trend	Learning Style						
	Active	Reflector	sensing	intuitive	visual	order	global
Balanced (1-3)	3	-	1	2	-	-	-
Moderate (5-7)	4	1	3	1	6	1	1
Strong (9-11)	1	-	1	-	1	-	1

The results of attitudes and skills are presented in Table 4 and Table 5 of students.

Table 4. Observation Results of Student Attitudes

Assessment Aspects	Experiment class	Kelas control	Predikat
cooperation	86,11	86,11	Very good
discipline	83,33	89,81	Very good
honestly	87,96	88,89	Very good
thorough	79,63	84,26	Good
Objective	84,26	80,56	Very good

Based on Table 4 and Table 5 it can be seen that the attitudes and skills of the students in the experimental class are in the good to very good predicate. The results of observing the attitudes and skills of the students in the experimental class indicated that the implementation of the active-reflective model learning generally worked well.

Table 5. Result of Observation of Students' Skills

Assessment Aspect	Eksperimen Class	Control Class	Predicate
Formulation of the problem	82,72	86,11	Very good

Make a hypothesis	77,78	77,78	good
Tool use	91,36	85,19	Very good
Observation	81,48	80,25	Very good
Results	74,07	77,78	good
Presentation Skills			
Conclusion	69,14	70,37	good

Data analysis of the student learning outcomes and analysis of students' thinking skills before and after learning are presented in Table 6.

Table 6. Analysis of student learning abilities

Description	Class control	Kelas Eksperimen
Initial test mean	20,44	21,18
Final test mean	60,78	83
Average n-gain	0,50	0,78
The number of students	27	27
Deviasi Standard	5,59	7,73

3. Statistical Test Result

Before the t-test, a prerequisite test was carried out, namely the prerequisite test, namely the normality test and the homogeneity test of students' learning outcomes data. The normality and homogeneity test results obtained:

Experimental class normality test obtained :

$c^{2hitung}$= -68,73, dan c^{2tabel} =c^2(1-a)(k–3)= 1,9.

The value of **$c^{2hitung}$<c^{2tabel}** shows that the data obtained is normally distributed

In the control class test obtained:

$c^{2hitung}$= -68,7, danc^{2tabel} =c^2(1 -a) (k – 3) = 5,99. Nilai**$c^{2hitung}$<c^{2tabel}** shows that the data obtained is normally distributed

the test criterion is that H_o is rejected if Fcount ≥ Ftable is obtained from the F data distribution and with probability α = 0,05. Because Fcount < F table or 1.91<2.74 the experimental class and control class data are homogeneous so that it can be carried out in the next test. The value of tcount= 13.12 and the value of t table= t (1- α), (n1 + n2-2)= 1.67. Based on the test criteria, Ho is rejected if t count > t table, and other t H1 prices are accepted, so it can be concluded that the active-reflective model can improve student learning outcomes.

RESULTS

Activity sheets (LKPD), teaching materials, learning implementation observation sheets, student skill observation sheets, student attitude observation sheets, critical thinking skills assessment sheets. The achievement of lecturers is validating learning tools aims to get advice about the depth of the material, the completeness of the scoring guide and test instruments (Mercer, Hennessy & Warwick, 2017)

Prior to the application of the active-reflective dimension model to the experimental class, requests for students learning styles were made using a learning style questionnaire. The results of learning style assistance (Figure 1), out of 27 students identified seven learning styles, the learning styles, the learning style dimension. The results of learning style assistance, according to research results (Shah, et al., 2013), the student learning styles vary (multilearning styles) and tend to one learning style. The result of learning style assistance show that students' learning styles vary.

The initial stage of learning with the ITG-DiA model begins with presenting a problem or question. The teacher conveys problems through natural phenomena related to the material for each meeting. Submission of material for each meeting. Submission of material through natural phenomena both illustrations and in the form of pictures. Students identify problems individually first, followed by discussion in groups. This is in accordance with Suyono & Hariyanto [8], which state that each student has his own learning style. Likewise, the opinion of Danim and Khairil [12] suggests that it is important for teachers to understand the learning styles of their students. Skills in identifying problems can help students find, improve and improve the quality of the processes and learning outcomes they do. (Slavin, 2011). Based on the problems that have been identified, followed by making a hypothesis. This stage occurs in the interaction between students in groups. Students with an active learning style dimension can influence their group members to be active in carrying out their respective tasks both individually and in groups. The average makes a hypothesis in the good category (77.78). The ability of students in designing experiments is still low, through teacher guidance students' abilities have increased. Students with learning styles with an

active reflective dimension have the ability to influence other students in their group to be active in designing experiments. This is in accordance with Narayani (2014) who argues that students with an active dimension learning style have strong learning abilities.

The ability of students to make observations is very good, this is known through the results of observing students' skills in conducting experiments with an expectation score of 81.48. According to Danim and Khairil [12] stated that students with an active learning style tend to always be active and understand the best information by doing it themselves. Likewise, the statement of Hanafiah and Suhana (2009), states that by maximally involving students' abilities, students find their own knowledge, attitudes and skills, as a form of change in behaviour.

Students' ability to report observations in the good category with a threat number of 74,07. At this stage, students write, process data, and discuss it in groups then report the results of group discussions. The purpose of data analysis is to process data into information so that the characteristics of the data are easy to understand and also useful for finding solutions to problems. The final stage of teacher evaluation is by asking one of the groups to present the results and the other group to give feedback, then drawing conclusions (implications, solutions, recommendations). The results of observing student activities at this stage show that students' abilities in making conclusions at the action number are 69.14 (good category). The results of observing the attitudes of students in the experimental class on each aspect of the assessment show that all aspects are assessed at good to very good predicates with sales figures of 79.63 to 87.63.

Based on the analysis of student learning outcomes Table 4.9, shows that the control class applies the guided inquiry learning model increased student learning outcomes by 40.34 with an n-gain of 0.50 (medium category) while in the experimental class, it was 61.82 with an n-gain of 0.78 (high category).

The results of the hypothesis test used the t-test value obtained tcount& ttable, namely 13.12> 1.67. The statistical test results showed that there was a significant difference between student learning outcomes in the control class which was taught using the guided inquiry model and the experimental class which was taught using the ITG-Dia model. These results are consistent with research by Ratman, et al., (2019) that the ITG-Dia model has an effect on improving chemistry learning outcomes. Based on the increase in student learning outcomes, the n-gain values of both classes and statistical tests it can be said that the application of the ITG-Dia model in chemistry learning has an effect on increasing student learning outcomes in chemistry learning. The effect of applying the ITG-DiA learning model can occur because of the teacher's role in conditioning learning so that students are able to develop their intelligence and critical thinking skills by accommodating student learning styles through the ITG-DiA model [10], for that the teacher should be familiar with learning styles so that students can design suitable learning [13]. This is in accordance with Kolb and Kolb [7] which state that teachers need to adapt their teaching style to students' learning styles. The effectiveness of the learning model is determined by the professionalism of the teacher in teaching lessons [14].

CONCLUSION

Based on the results of the research and the description in the discussion, it can be concluded that the application of the ITG-DiA model in chemistry learning can improve student learning outcomes in class XI MAN 2 Palu City by 61.82, n-gain value 0.78 (high category), the test results obtained for the loan value tcount (13.12) > ttable. (1.67), indicating that there is an influence of the ITD-Dia learning model on chemistry learning on improving student learning outcomes.

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