The Effect of Guided Inquiry Model with Active-Reflective Dimensional Learning Style on High School 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>
<thead>
<tr>
<th>Table 3.1 Research Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Experiment</td>
</tr>
<tr>
<td>Control</td>
</tr>
</tbody>
</table>

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:

\[ g = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} \times 100 \]

**Hypothesis testing**

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

Ho: \( \mu_1 = \mu_2 \) student learning outcomes following learning using ITG-Dia are the same as students taking learning using conventional models.

Ha: \( \mu_1 \neq \mu_2 \) 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**

<table>
<thead>
<tr>
<th>N.</th>
<th>Rated aspect</th>
<th>LKPD Average Score and Category Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>1</td>
<td>Formulation of Objectives</td>
<td>3.40</td>
</tr>
<tr>
<td>2</td>
<td>Material</td>
<td>3.65</td>
</tr>
<tr>
<td>3</td>
<td>Language</td>
<td>3.40</td>
</tr>
<tr>
<td>4</td>
<td>Time Allocation</td>
<td>3.54</td>
</tr>
<tr>
<td>5</td>
<td>Learning Activities</td>
<td>3.45</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Trend</th>
<th>Learning Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balanced</td>
<td>Active</td>
</tr>
<tr>
<td>(1-3)</td>
<td>3</td>
</tr>
<tr>
<td>Moderate</td>
<td>4</td>
</tr>
<tr>
<td>Strong (9-11)</td>
<td>1</td>
</tr>
</tbody>
</table>

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

**Table 4. Observation Results of Student Attitudes**

<table>
<thead>
<tr>
<th>Assessment Aspects</th>
<th>Experiment Class</th>
<th>Kelas Control</th>
<th>Predikat</th>
</tr>
</thead>
<tbody>
<tr>
<td>cooperation</td>
<td>86.11</td>
<td>86.11</td>
<td>Very good</td>
</tr>
<tr>
<td>discipline</td>
<td>83.33</td>
<td>89.81</td>
<td>Very good</td>
</tr>
<tr>
<td>honestly</td>
<td>87.96</td>
<td>88.89</td>
<td>Very good</td>
</tr>
<tr>
<td>thorough</td>
<td>79.63</td>
<td>84.26</td>
<td>Good</td>
</tr>
<tr>
<td>Objective</td>
<td>84.26</td>
<td>80.56</td>
<td>Very good</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Assessment Aspect</th>
<th>Eksperimen Class</th>
<th>Control Class</th>
<th>Predikat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulation of the problem</td>
<td>82.72</td>
<td>86.11</td>
<td>Very good</td>
</tr>
</tbody>
</table>
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, 83 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

### Table 6. Analysis of student learning abilities

<table>
<thead>
<tr>
<th>Description</th>
<th>Kelas Eksperimen</th>
<th>Kelas Kontrol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial test mean</td>
<td>20,44</td>
<td>20,78</td>
</tr>
<tr>
<td>Final test mean</td>
<td>60,78</td>
<td>60,50</td>
</tr>
<tr>
<td>Average n-gain</td>
<td>0,50</td>
<td>0,50</td>
</tr>
<tr>
<td>The number of students</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Deviasi Standard</td>
<td>5,59</td>
<td>5,59</td>
</tr>
</tbody>
</table>

### 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:
  \[ c_{hitung} = -68,73, \text{dan } c_{table} = c^2(1-a)(k-3) = 1,9. \]
  The value of \( c_{hitung} < c_{table} \) shows that the data obtained is normally distributed.

- In the control class test obtained:
  \[ c_{hitung} = -68,7, \text{dan } c_{table} = c^2(1-a)(k-3) = 5,99. \]
  Nilai \( c_{hitung} < c_{table} \) shows that the data obtained is normally distributed.

The test criterion is that \( H_0 \) is rejected if \( F_{count} \geq F_{table} \) is obtained from the F distribution and with probability \( \alpha = 0,05 \). Because \( F_{count} < F_{table} \) 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 \( t_{count} = 13,12 \) and the value of \( t_{table} = t(1-a), (n1+n2-2) = 1,67. \) Based on the test criteria, \( H_0 \) 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

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

<table>
<thead>
<tr>
<th>Description</th>
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</tr>
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<tbody>
<tr>
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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 &gt; 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) &gt; 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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