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HOW IS STUDENT SCIENTIFIC ATTITUDE PROFILE TOWARD CHEMISTRY LEARNING WITH RESEARCH-ORIENTED COLLABORATIVE INQUIRY LEARNING?

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Abstract: This study aims to describe the profile of scientific attitudes of XI grade high school students in Sleman who learned with the Research-Oriented Collaborative Inquiry Learning REORCILEA. The sample in this research was 30 high school students who were selected using a purposive sampling technique. REORCILEA is an integrated learning model between research-based, inquiry, and collaborative learning. The research was descriptive qualitative designed, and the results of the descriptive analysis revealed that high school students who taught with REORCILEA had a 10% good, 86, 67 % enough, and 3.33 % low scientific attitude profile. Scientific attitude toward chemistry learning profile assessed with a questionnaire developed by the researcher. Students' scientific attitudes are described by seven aspects of scientific attitude, specifically curiosity, rational thinking, openmindedness, concern with evidence, and honest acting according to the rules.

Keywords: *Attitude, Chemistry learning, Research Oriented Collaborative Inquiry Learning (REORCILEA)*

INTRODUCTION

Individual skills and qualities are needed to be able to compete. The progress of the times forces every area of life to always change according to the demands of the times. Accordingly, the field of education is improving to be better. One way to improve the quality of graduates is to change learning objectives to be more complex. Currently, learning objectives focus on improving learning outcomes, starting from the cognitive, affective, and psychomotor aspects. Students' attitudes are one of the main goals of learning [1]. Although the attitude toward chemistry learning doesn't has a significant effect on improving student achievement, if it is related to self-concept, logical thinking, and attituded could be said to be important in influencing the academic achievement of students [2].

The complex science of chemistry has implications for how chemistry learning is taught [3]. Although, several aspects of scientific attitude are unobservable directly during lessons [4]. Attitude is a mental entity that is stable in expressing human feel and tends to react to each class member in the same general way [5]. People's attitudes will be spontaneous and consistent with their beliefs and guide behavior accordingly. The components of attitude formation are (a) behavioral belief, namely beliefs that a person has about behavior, and a belief that will encourage the formation of attitudes, (b) evaluation of behavioral belief, which is an individual's positive or negative evaluation of certain behaviors based on beliefs owned [6]. Attitude affects academic achievement because it is considered an important role for students in achieving their goals and can be maintained for a long time [7]. The scientific attitude tends to foster scientific achievement [8]. Attitude toward chemistry has a meaningful effect on students' achievement in learning chemistry [9]. Attitudes are directly related to a problem, such as individual beliefs in scientific abilities, current and future career interests, and goals [10]. Someone with a scientific attitude will have high curiosity about various things around him and play an important role in his success [11]. Six coverage in a scientific attitude, specifically the inclination to know and understand, ask everything, collect data and provide meaning based on data, guide verification, think logically, and consider ideas [12].

Based on this description, the conclusion is that the scientific attitude is a logical way of thinking for students in responding to certain stimuli based on the rules of scientific ethics. Scientific attitudes are often associated with the habit of scientific thinking, which is a logical way of thinking without prejudice and not accepting any information with no authentic evidence. REORCILEA learning is a systematic, methodological, and consistent investigation effort to test the truth to generate new knowledge using laboratories [13]. Inquiry ability is the ability of students to plan research and explain research results. Besides that, students' interest in doing research has also increased [14]. Teachers can use laboratories activity to teach the active learning

process [15]. Learning with the experimental method can increase students' interest in the learning process and reduce their anxiety in the laboratory [16]. The REORCILEA learning model is intended to overcome various problems in implementing education, such as changing the teacher's perspective on the importance of conducting research. Critical thinking skills and scientific attitudes of students will improve with REORCILEA learning. This model is expected to increase participation and provide meaningful learning experiences for students to improve their critical thinking skills and scientific attitudes.

The scientific attitude affects the academic achievement of students [16]-[20] because students who have a positive attitude will be interested in the life of science. The attitudes of students in learning can affect the learning process. In this study, indicators of scientific attitudes used include curiosity, rational thinking, open-mindedness, objectivity, being concerned with evidence, honesty, and acting according to rules. Scientific attitude questionnaires are given to students to get an assessment of the components and statements described in the instrument. Questionnaires used to obtain confirmation regarding students' attitudes and opinions during the learning process using REORCILEA consists of six syntaxes, specifically, initiating, hypothesizing, experimenting, writing dan evaluating & reflecting [12]. The indicators of scientific attitudes analyzed were curiosity, rational thinking, open-mindedness, objectivity, attaching importance to evidence, honesty, and acting according to the rules. All indicators are gridded in an equal number of 30 positive and negative statements.

RESEARCH METHODS

The research was descriptive and qualitative designed. This study aims to determine the profile of the scientific attitudes of high school students who learned using the REORCELIA learning model in chemical equilibrium. The research population is high school students in Yogyakarta. This study used a questionnaire developed by the researcher. The questionnaire consists of 30 statements divided into two with the same number of positive and negative. The scientific attitude questionnaire grid used in this study can see in table 1.

Table 1. The scientific attitude questionnaire grid.

Attitude's aspects	Indicator	No item	Jumlah
Curiosity	Have an interest in chemistry	1, 2, 3, 16, 24, dan 29	6
Rational Thinking	Can think logically and under common sense	4, 17, 5 dan 30	4
Open minded	Can receive new ideas and knowledge	6,7,18 dan 25	4
Objective	Be objective in making decisions	8, 9, 26 and 19	4
Concerned with Evidence	Does not easy to believe an idea without evidence	10, 11, 27 and 20	4
Be Honest	Want to reveal the truth without manipulating	12, 13, 21 and 28	4
Act according to the rules	Has a responsibility toward science	14, 22, 15 and 23	4

The results of the validity and reliability of the questionnaire on students obtained the allowed MNSQ output value. Subsequently, one statement that gives an MNSQ outfit value> 1.33 (invalid) did not use in the study. Meanwhile, the reliability of the questionnaire used was 0.73 means that the questionnaire was suitable for use in research. The questionnaire uses 4 Likert scales. The scientific attitude data obtained were then analyzed overall to determine the category of scientific attitudes of students in general. The formula used to determine the level of scientific attitudes of students is:

$$\text{Percentage Score} = \frac{\text{total score}}{\text{maximum score}} \text{x}100\%$$

The results of these calculations were then categorized according to the criteria in Table 2

Table 2. Attitude toward the chemistry category

Percentage scale	Category
86 -100%	Very Good
76-85 %	Good
60-75 %	Enough
55-59 %	Low
54 %	Very Low

RESULT AND DISCUSSION

The students' scientific attitude is measured using a scientific attitude questionnaire developed by researchers by combining the opinions of several experts regarding the scientific attitude of students in learning. The result of qualitative descriptive analysis, the student's scientific attitude who learned using the REORCILEA model, shows

a scientific attitude that is generally in enough category. The results of this study are the same as a survey conducted on 1334 middle-level students in physics and chemistry classes in China found that the use of constructivism-based learning or direct learning can initiate the formation of students' scientific attitudes [21]. The increase in scientific attitude in students shows the thinning of the gap between the learning expected by students and the experiences they get in the classroom [21]. Figure 1 shows Student's Attitude Categories and Table 3 indicates attitude toward chemistry result.

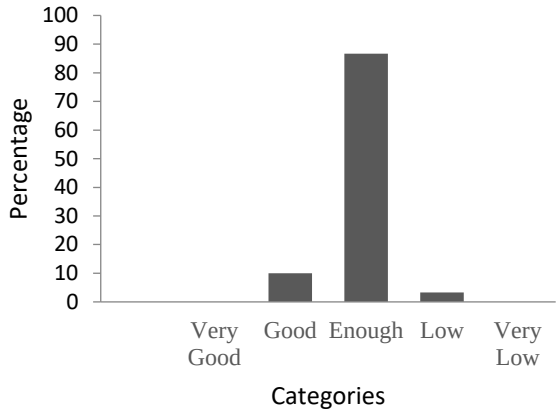

Figure 1. Student's Attitude Categories

Students' scientific attitude is grown by applying learning models that encourage the emergence of scientific attitudes in students. Based on research conducted revealed that using a learning model can improve scientific attitudes because it has a syntax that can fill the emergence of scientific attitudes [22]. Indicators categorize of scientific attitudes of students in the experimental class and table 1. The indicator of scientific attitudes in this class, which has the lowest category, is curiosity, meaning that students have the lowest interest in chemistry. This result could be the reason why students generally have enough scientific attitudes. Some students interviewed by the teacher stated that their achievement could improve because they liked the learning method used, so this method has a positive effect in increasing their learning outcomes [22]. Otherwise, they will accept the new experience if they like the instruction.

The indicator of scientific attitudes that was highest in the two classes was an indicator of the importance of evidence and objective, while the lowest was an indicator of curiosity. Students in this study had the lowest interest in learning chemistry, but students still had a scientific attitude that was successfully raised by applying the REORCILEA learning model. This model provides opportunities for students to express their creativity so that students become more trained and foster their scientific attitudes. The mapping of indicators for students' scientific attitudes in this study is generally in enough category, possibly due to the inadequate application of the REORCILEA learning model in the experimental class, so it cannot bring up a more prominent scientific attitude in the experiment's class. The short-time application of the model in a short time also affects the results [23].

Table 3. Attitude toward chemistry result

Aspects	Sum of Item	Percentage of the domain	Category
Curiosity	6	58.18	Low
Rational Thinking	4	66.29	Enough
Open minded	4	74.11	Enough
Objective	4	75.81	Good
Concerned with Evidence	4	75.89	Good
Be Honest	4	68.75	Enough
Act according to the rules	4	64.73	Enough

Another possibility is using research instruments that cannot reflect the scientific attitudes of students more realistically. The most appropriate research instrument to use is suitable for finding out students 'attitudes towards chemistry, namely the ASCI attitude subject of chemistry inventory, which is a very proper instrument to determine students' attitudes towards chemistry and its effect on student achievement, and vice versa, that achievement can also affect the attitudes of students [24]. These results are supported by observational data on students' responses to the application of the REORCILEA model based on response indicators that are by the REORCILEA model syntax by comparing the total score obtained on each syntax indicator with the maximum score of the syntax, then converted in percentage form as shown in Figure 2.

Figure 2 shows students' responses to applying the REORCILEA model increased in several aspects. They were constant in other aspects, meaning students responded positively at each meeting. Students in the experimental class were given a treatment of applying the REORCILEA learning model consisting of six syntaxes, specifically initiating, hypothesizing,

experimenting, writing, and evaluating & reflecting [12]. Learning is assisted by having student worksheets according to the REORCILEA syntax. Student responses when studying with REORCILEA were observed by an observer using student activity sheets during the lesson. The research process involved one observer in each meeting, but in the practicum process at the third meeting, each class needed more than two observers to observe the student's movements during the learning process.

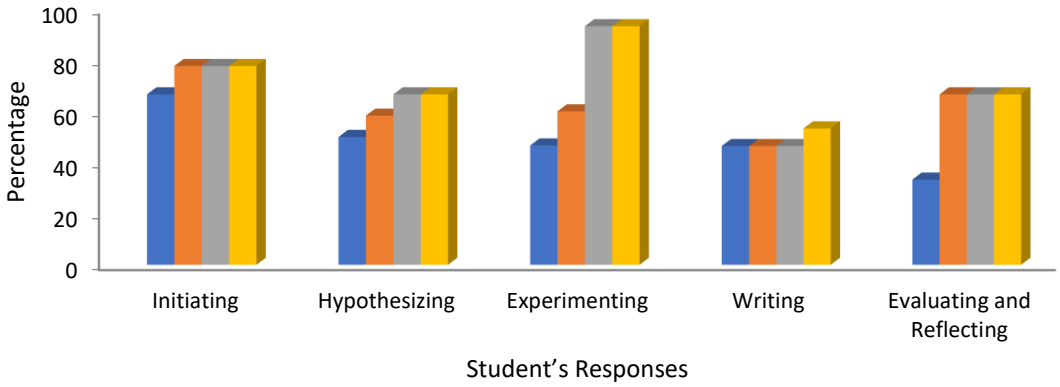

Figure 2: Student's Responses From 1st to 4th Meetings

The REORCILEA model provides a new atmosphere for students in the learning process and improves students' abilities. REORCILEA trains students to be more active in studying literature so that students can do the task quite well. In addition, the syntax in the student worksheets arrangement based on the REORCILEA model also makes students more independent. Collaborative inquiry learning is highly recommended to encourage students to work in complex and in unexpected circumstances so that students become critical [25].

CONCLUSION

Based on this research, the scientific attitude of high school students in Yogyakarta is categorized as good. The application of the REORCILEA learning model can contribute to the formation of scientific attitudes of students during the learning process. The research facts found can be used as a reference for educators in high school to apply a learning model that encourages the student's activeness so that scientific attitudes can be increased. A scientific attitude can also be used as a reference to improve student learning outcomes.

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