Students’ attitude profile towards chemistry based on Research-Oriented Collaborative Inquiry Learning Model (REORCILEA)

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Abstract. Scientific attitude is one of the important attitudes that can support the learning of chemistry. Scientific attitude can make students more active in learning students will be more curious that is related to student achievement. The sample of this study is 66 senior high school students as participants who apply the Research-Oriented Collaborative Inquiry Learning model. The questionnaire was validated with person reliability item reliability and item fit in good category. The results showed that most students had scientific attitudes in the average and high categories. The most dominant aspect of scientific attitude is rationality and the lowest aspect is the suspend judgment. The learning model provides more experience for students and scientific attitude can improve for better learning achievement.

1. Introduction
Chemistry is one of the applied sciences that is very important for our lives[1]. Chemistry learning topics consist of knowledge that contains concepts, principles, and facts [2]. A new paradigm in education where the purpose of learning is not only to change students 'thinking patterns but also to build students' character and professional attitudes[3]. The most important purpose of science education is to teach students how to be involved in an investigation. Students are required to be able to integrate knowledge, skills, and attitudes to get a better understanding of scientific concepts. So the teacher must put more emphasis on learning about science skills such as concepts, theories, facts, and encourage students to conduct scientific research[4]. Learning is part of the process of developing individuals to have a better understanding attitude about a topic or learning material [5]. The environment of the student learning environment is very influential in student's changing attitudes. Developing students' attitudes towards science is one of the most important purposes of applying learning models[6].

Attitude is a condition in a person that can affect his actions. Attitude can also be referred to as a person's response to doing something [7]. A scientific attitude is a way to think logically, and reasonably. An opinion on scientific facts cannot be accepted if it does not have evidence [8]. Students' scientific attitudes of students can encourage interest in asking questions and enthusiasm in the learning process[9]. Someone who has a scientific attitude is very curious to know more explanations about events or other things that are in the surrounding environment to get the right explanation and responses that answer the question, do not believe in something that does not exist, occur without valid reasons,
do not believe in misfortune and superstition, believe in events that have scientific principles [10]. According to Gauld & Hukins [11], scientific attitudes are described in seven components, such as rationality, curiosity, open-mindedness, objectivity, honesty, suspend judgment, and critical thinking. Chemistry is one of the subjects that are closely related to activities in the laboratory. This activity provides a variety of understanding and skills through experimental activities. The teacher in the learning process must encourage students to actively support various experiments. The Collaborative-Oriented Learning Research Model is one of the constructivist learning models that involve students as learning subjects. This learning model makes students actively conduct experiments and analyze the results of experiments The Research-Oriented Collaborative Learning. Model is one of the constitutional learning models that involve students as learning subjects. This model is designed to facilitate students by integrating learning and experimentation. Students are required to carry out experimental activities and observe and analyze to be able to understand an event. Using Research-Oriented Research Inquiry Learning Models (REORCILEA), students become more active in their learning of seeing, testing, and conducting experiments[12]. The implementation of learning in this laboratory does not only aim to get better learning outcomes but is also more useful so that the learning process of chemistry is easier to understand by increasing the use of laboratories in the process of learning chemistry[1]. School laboratory activities can be used as one of the important learning media to improve student science learning outcomes; Teachers need the knowledge, skills, and resources that enable them to teach effectively, interact intellectually and physically, implement investigation and reflection[13]. Inquiry-based learning has an interesting difference from the above learning. Inquiry-based learning has the main characteristic of students who are fully involved in the learning process that develops analytical skills and skills [14].

In learning chemistry students are expected to have a scientific attitude to be able to understand chemistry learning material well. If the scientific attitude possessed by students will have a positive impact on students' ability to solve problems, student performance activities, and student learning achievement. The results of the diagnostic tests can be used by the teacher as an alternative reference for improving students' scientific attitudes. Therefore, the need for research on the measurement scientific attitude of students after the learning model is implemented. in the 21st century, it is important to improve students' abilities.

2. Method
This research is a descriptive study to describe the profile of students' scientific attitudes in the learning process using the REORCILEA Learning Model. The sample used in this study was 66 high school students in the province of Bengkulu selected by convening sampling technique with a population of all high school and MA students in Bengkulu. Data were collected using a scientific attitude questionnaire containing 26 statements consisting of positive statements and negative statements. The results of the questionnaire were analyzed with a Likert scale in 4 scales with 4 statements of strongly agree, agree, disagree, and disagree and determining the categorization of rating. For positive statements, statements of strongly agree, agree, disagree, and very disagree are made (4-3-2-1) and for negative statements (1-2-3-4). The questionnaire used in this study was developed based on indicators and has been Validation is done using the Rasch model whose purpose is to find out the quality and appropriateness of the statement items with the model or item fit. The results of the analysis using the Rasch model are all items and questionnaire statements are declared valid because they meet the criteria of item compatibility. Rasch model. An item or test/case/person has declared fit in a model according to Boone et al [15]

| OUTFIT MNSQ Value | OUTFIT ZSTD Value | Point Measure Correlation |
|-------------------|-------------------|--------------------------|
| 0,5 < MNSQ <1,5   | -2,0 < ZSTD < + 2,0| 0,4 < Pt Measure Corr < 0,85 |
Instrument reliability is determined by the value of Person Reliability and Item Reliability. To find out the consistency of the answers and find out the quality of items [16]. Criteria for person reliability Value Item Reliability according to Fisher [17].

### Table 2. Criteria Person Reliability and Item Reliability value

| Person Reliability and Item Reliability value | Criteria    |
|-----------------------------------------------|-------------|
| < 0.67                                        | Poor        |
| 0.67 – 0.80                                   | Fair        |
| 0.81 – 0.90                                   | Good        |
| 0.91 – 0.94                                   | Very Good   |
| > 0.94                                        | Excellent   |

3. Result and Discussion

3.1. Validation of the Scientific Attitude questionnaire

The questionnaire used in this research was first validated using the Rasch model in table 3 showing that the value of person reliability and item reliability was in a good category.

### Table 3. Reliability questionnaire

| Person Reliability | Item Reliability | Criteria |
|--------------------|------------------|----------|
| 0.9                | 0.84             | Good     |

whereas for the results of the analysis of item fit-out of 28 questionnaire items, only 2 items did not meet the criteria for MNSQ outfit, ZSTD outfit, and point measure correlation.

3.2. Student’s Scientific Attitude Level

Studying chemistry allows students to be able to understand what is happening around them, but chemistry has many abstract concepts and is difficult to understand [18]. Some concepts are even difficult to explain by analogy and model[19]. Science education has the most important goal of teaching students how to be involved in the inquiry process. Students must be able to integrate knowledge, skills, and attitudes to understand scientific concepts better [20] Student attitude is an important aspect in supporting an understanding of learning concepts. Many research reported a significant relationship between science attitudes and student achievement [21], [22], [23].

### Table 4. Student’s Scientific Attitude Level

| Total Score | Percentage | Level of Scientific Attitude |
|-------------|------------|------------------------------|
| below 40    | 0          | Very Low                     |
| 41-55       | 5          | Low                          |
| 56-70       | 22         | Average                      |
| 71-85       | 34         | High                         |
| above 85    | 2          | Very High                    |

Table 4 shows students who filled out the questionnaire which was divided into 4 categories, very low, low, medium, high, and very high score results filled out the questionnaire for positive statements and negative statements. Overall, the level of Scientific Attitude is dominant at high and medium levels. Only 2 students were in the very high category and no students were in the very low category. Based on the results of the study, students' scientific attitudes are in the average and high categories. These results can explain students’ interest in learning chemistry using the Research-Oriented Collaborative Inquiry Learning model which is applied in the classroom. This learning model provides more experience for students through experiments that were previously designed by themselves and the hypothesis that will
be answered based on a theoretical study conducted in advance [12]. The scientific attitude of students after learning with practicum-based learning [24], inquiry [25] is better when compared to students who only listen to the explanation from the teacher in front of the class.

3.3. Percentage of Scientific Attitude aspect
The aspects of scientific attitude used in this study are classified into 8 components, such as rationality, curiosity, open-mindedness, objectivity, intellectual honesty, suspend judgment, critical thinking, and humility based on aspects of scientific attitude according to Gauld & Hukins [11].

![Figure 1. Figure Percentage of Scientific Attitude aspect](image)

Figure 1. shows the percentage of each aspect of Scientific Attitude, each aspect has almost the same range of values. Based on the 8 aspects of Scientific Attitude, the most dominant aspect is rationality while the lowest aspect is the suspend judgment. Research conducted by Lacap, M. P [26] reports the same thing. In addition to the suspend judgment of other aspects that have a low percentage is the open-mindedness that is the attitude of people to revise their opinions and conclusions, accepting the new findings, and rejects data that is not supported by relevant theory. The low level of the two aspects shows that there is a relationship between open-mindedness and suspend judgment. While the aspects that have the highest percentage are rationality and objectivity. This aspect shows students seeking an explanation and the reasons for the events that occurred

4. Conclusion
In this study, students' scientific attitude data were collected using a questionnaire that has good validity and reliability. Based on the results obtained it can be concluded that the scientific attitude of students who follow the learning process using the REORCILEA learning model in the average and high categories, it is influenced by the learning experience gained by students. Aspects of scientific attitude rationality, curiosity, open-mindedness, objectivity, honesty, suspend judgment, and critical thinking, the highest percentage of aspects is rationality and the lowest is the aspect of suspend judgment and this scientific attitude can improve student learning achievement.

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