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Analysis of Students' Scientific Attitude Through Experience Practicum Activities in Chemistry Learning

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Abstract: This research aims to analyze and determine the profile of scientific attitudes of class XI students at SMA Negeri 1 Woja, West Nusa Tenggara based on chemistry practicum experience. This research is aquantitative descriptive research with the method used is the survey method. The research instrument used was a closed questionnaire, then analyzed quantitatively by calculating the percentage of the overall score or average value and categorized. The results of the research show that the scientific attitude in the aspect of curiosity got a score of 87.55% with very good criteria, honesty attitude got a score of 83% with good criteria, Objectify attitude got a score of 85.85% with very good criteria, perseverance got a score of 85.96% with very good criteria, conscientiousness got a score of 85.65% with very good criteria, Openness attitude got a score of 87.56% with very good criteria, Being critical thinking got a score of 84.44% with good criteria, responsibility got a score of 87.39% with very good criteria. So it can be concluded that students' scientific attitudes through chemistry practical experience have a score of 75.37% with good criteria.

Keywords: Chemistry practicum; Scientific attitude

Introduction

The influence of developments in science and technology in the 21st century means that education has an important role in improving the quality of Indonesia's human resources, namely individuals who are faithful, independent, advanced, intelligent, creative, skilled, responsible and productive. Various educational efforts have been made to improve the quality of human resources. One way is to carry out studies and develop the curriculum in Indonesia in a gradual, consistent manner and adapted to developments and progress over time (Solihah, 2023). The curriculum currently being implemented in Indonesia requires mastering various skills and skills in an effort to develop the character of students. In terms of education in the 21st century, not only does it require students to prioritize achieving cognitive aspects, but skills also play an important role in the 21st century. Skills are an important component needed in various areas of life (Mardhiyah et al., 2021). These skills can be achieved if students have scientific skills and a scientific attitude (Saputri et al., 2022). Student attitude is one of the main goals of learning (Sharma, 2015). Attitude can influence academic achievement because it is considered to play an important role for students in achieving their goals and can be maintained over a long period of time (Solpuk, 2017). One of the attitudes in question is a scientific attitude.

Scientific attitude is an individual's tendency to act to solve a systematic problem through scientific steps (Murningsih et al., 2016). Other researchers state that a scientific attitude is a person's ability to carry out actions consistently, objectively and rationally in solving problems or carrying out a research process which is reflected through a person's behavior (Astuti et al., 2020). A scientific attitude is an attitude that must be present in a scientist or academic when facing scientific problems (Gunada et al., 2017). Scientific attitudes in learning are often associated with attitudes towards science. A scientific attitude is more likely to foster students' scientific achievements (Montes et al., 2018). To

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find out the scientific attitudes of students, especially in the science learning process, one of the closely related subjects is chemistry. The influence of attitudes towards chemistry has a significant tendency towards chemistry learning achievement (Mantzicopoulos et al., 2008).

Chemistry is a field of scientific study that was developed based on experiments that seek answers to the questions of what, why and how of natural phenomena (Depdiknas, 2003). Chemistry is closely related to practical activities in the laboratory, because learning chemistry cannot be separated from observation and experimental activities which really require certain attitudes such as responsibility and honestyy when collecting and analyzing data (Sari et al., 2019). Chemistry learning activities should be packaged in such a way as to facilitate students to develop not only mastery of concepts and thinking skills, but also scientific attitudes. Providing direct experience, such as practical activities, can be one of the learning methods that can be used to achieve chemistry learning objectives. So science learning emphasizes providing direct learning experiences through the use and development of process skills and scientific attitudes (Emda, 2017). In line with Novalinda (2022), scientific attitudes can be trained, one of which is through practicums.

In chemistry education, practical activities are needed to realize abstract concepts and chemistry learning in the laboratory has been developed and implemented since 1970 (Kusumaningtyas et al., 2018). Practicum is a part of learning that aims to provide students with the opportunity to test a concept. This subject provides experience in applying scientific methods, getting the opportunity to test hypotheses by designing experiments, collecting data, organizing and interpreting data, and interpreting experimental results (Redhana et al., 2020). Practicum is an activity that provides direct experience to students so that students can develop their scientific attitudes. This can act as a guiding factor when students enter new experiences. Over time, with positive experiences and adjustments in attitudes, students will become more open to science, think differently, and gather more useful ideas (Rosita et al., 2016).

According to the assessment guide for high school, there are at least 5 aspects of attitude that must be developed in students, namely: Honesty, which is trustworthy behavior in words, actions and work. Discipline, is an action that shows orderly behavior and compliance with various rules and regulations. Responsibility, is a person's attitude and behavior to carry out his duties and obligations, which should be carried out towards himself, society, the environment (natural, social and cultural), the country and God Almighty. Mutual cooperation, is working together with other people to achieve common goals by sharing tasks and helping each other. Self-confidence, namely a belief in one's own ability to carry out activities or actions (Solihah, 2023). Aspects of scientific attitude can refer to curiosity, honestyy, objectivity, perseverance, thoroughness, openness, critical thinking, and a sense of responsibility (Supardi et al., 2019). Apart from that, aspects of scientific attitude consist of individual traits and behavior, including honesty behavior, curiosity, openness, responsibility, logical and objective thinking, and critical thinking (Wahyudiati, 2021). Other research states that a scientific attitude consists of an attitude of curiosity, open-mindedness, an attitude of discovery, an open attitude, honestyy, critical thinking, objectivity, responsibility, cooperation, a firm stance is someone who has a scientific attitude (Saputri et al., 2022).

However, the fact is that not all students can apply scientific attitudes optimally so that students' scientific attitudes tend to be low. This is because students are used to receiving information conveyed by teachers and this results in no effort to seek the truth of the information they have received (Sa'adah et al., 2017). This is in line with the research results of Misbah et al. (2018) who said that the scientific attitude score of students in one of the senior high schools in Indonesia was still in the average range of 1.42 from the highest score of 3. The same thing was expressed by Ozden et al. (2014) that the attitude score Students' scientific knowledge is still at an average level of 139.7 from the highest score of 200. Therefore, it is important for students to be serious about applying a scientific attitude when carrying out practical activities.

Students who have a high scientific attitude will have fluency in thinking so that students will be motivated to always excel and have a strong commitment to achieving success and excellence (Alfathy et al., 2018). This means that practicum has a close relationship in developing students' scientific attitudes (Subiantoro, 2010).

Based on the explanation above, it is important to carry out research to analyze scientific attitudes through the chemistry practicum experiences that students have had. This is an important step to find out various skills including scientific attitudes of students.

Method

This research uses quantitative descriptive research, the method used is a cross-sectional survey method. The research was conducted in April 2023 at SMA Negeri 1 Woja in, West Nusa Tenggara using four classes totaling 123 class XI students as samples. The research carried out aims to analyze and determine the

scientific attitude profile of class XI students at SMA Negeri 1 Woja in Dompu Regency, West Nusa Tenggara.

The data collection technique in this research used a scientific attitude questionnaire sheet. The questionnaire sheet used aims to determine students' scientific attitudes with 33 questions using a 5 Likert scale (scale 1: very poor, scale 2: poor, scale 3: sufficient, scale 4: good, and scale 5: very good). The instrument data is used to determine the scientific attitude profile of students in class XI who have experience carrying out chemistry practicum activities.

The research instruments used were first validated theoretically by experts. The data is then analyzed quantitatively by calculating the percentage of the overall score or the average value of the results on the scientific attitude questionnaire that the students have filled out and categorized. Scoring categories for assessing students' scientific attitudes can be seen in Table 1. Then the results obtained are described in the form of tables and graphs to assist in making decisions.

Table 1. Scoring Categories for Students' Scientific Attitudes

Category	Percentage (%)
Very good	$\bar{x} > 85$
Good	$70 < \bar{x} \leq 85$
Enough	$55 < \bar{x} \leq 70$
Not enough	$40 < \bar{x} \leq 55$
Very less	$\bar{x} \leq 40$

Result and Discussion

Scientific attitudes are observed from the chemistry practicum experiences that have been carried out by students. The aspects of scientific attitude assessed are curiosity, honestyy, Objectify, Perseverence, Conscientious, Openness, being critical and Being responsibility, as can be seen in Table 2.

Table 2. Average Scientific Attitude of Students

Aspect	Percentage (%)
Curiousity	87.55
Honesty	83 .00
Objectify	85.85
Perseverence	85.96
Conscientious	85.65
Openessness	87.56
Being critical	84.44
Being responsibility	87.39
Average	75.37

The scientific attitude shown in table 2 can be seen that the scientific attitude for each aspect measured has a different result score. The scientific attitude seen from the aspect of curiosity obtained an average score of 87.55%. The honesty aspect obtained an average score of 83%. The Objectify aspect obtained an average score of 85.85%. The Perseverence aspect obtained an average score of 85.96%. The Conscientious aspect obtained an average score of 85.65%. The Openness aspect obtained an average score of 87.56%. The being critical aspect obtained an average score of 84.44%, and the responsibility aspect obtained an average score of 87.39%. The following are the criteria for obtaining students' scientific attitude results which can be seen in Table 3.

Table 3. Criteria for Students' Scientific Attitudes

Aspect	Percentage
Curiousity	Very good
Honesty	Good
Objectify	Very good
Perseverence	Very good
Conscientious	Very good
Openessness	Very good
Being critical	Good
Being responsibility	Very good
Average	Good

Table 3 shows that the scientific attitude aspect, namely the curiosity attitude, has very good criteria, the honesty aspect has good criteria, the Objectify aspect has very good criteria, the Perseverence aspect has very good criteria, the conscientious aspect has very good criteria, the Openness aspect has very good criteria. good, the Being critical aspect has good criteria, while the responsibility aspect has very good criteria. Based on the observed aspects of scientific attitude, the overall average scientific attitude results were obtained with good criteria. The graph of the results of obtaining a scientific attitude can be seen in figure 1.

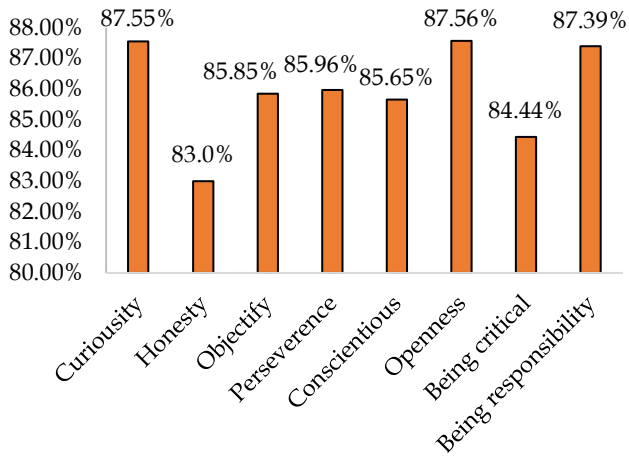

Figure 1. Graph of aspects of students' scientific attitudes

Chemistry is one of the subjects that transfer's scientific knowledge and is of course based on a scientific attitude. This is because the implementation of

chemistry lessons is partly carried out using practical procedures. The results of each aspect analysis and scientific attitude indicators will be described in more detail as follows:

Aspect of Curiousity

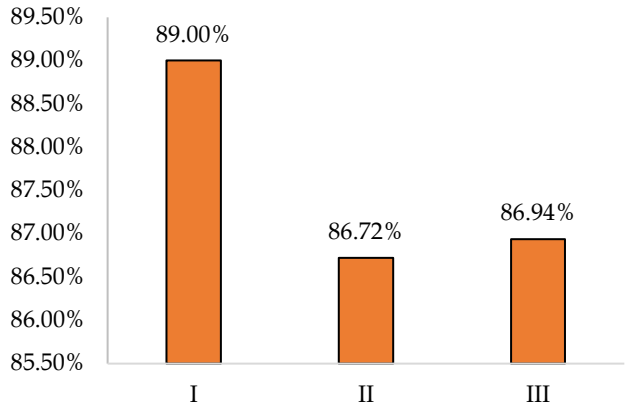

Figure 2. Percentage graph of the curiousity attitude aspect

Aspect of Honesty Attitude

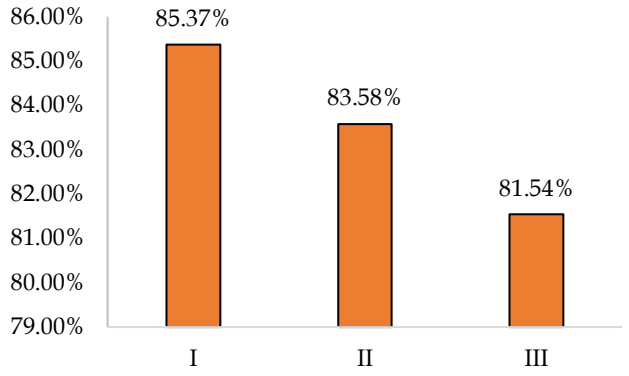

Figure 3. Graph of the percentage of honesty attitude aspects

Aspect of Objectify attitude

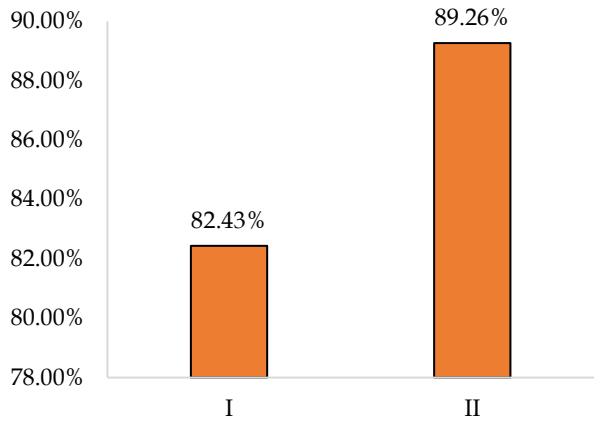

Figure 4. Graph of the percentage of objectify attitude aspect

Aspect of Perseverance Attitude

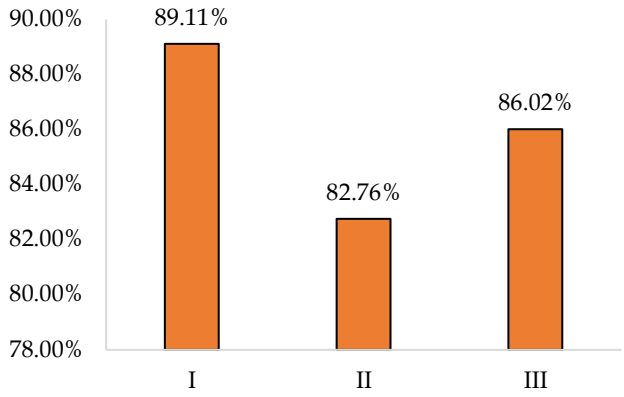

Figure 5. Graph of the percentage of perseverence attitude aspect

Aspect of Conscientious Attitude

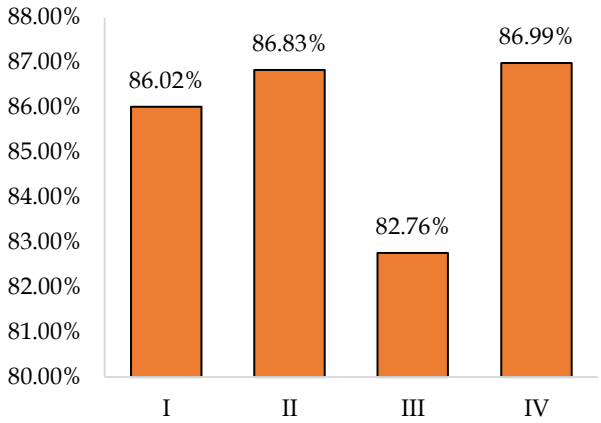

Figure 6. Graph of the percentage of conscientious attitude aspect

Aspect of Openness Attitude

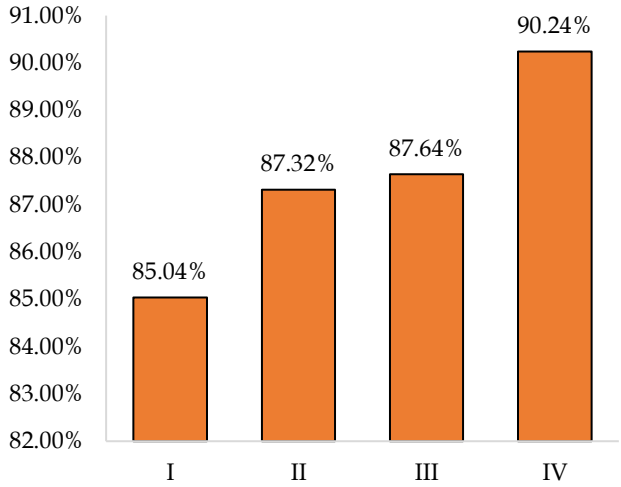

Figure 7. Graph of the percentage of openness attitude aspect

Aspect of Being Critical Thinking Attitude

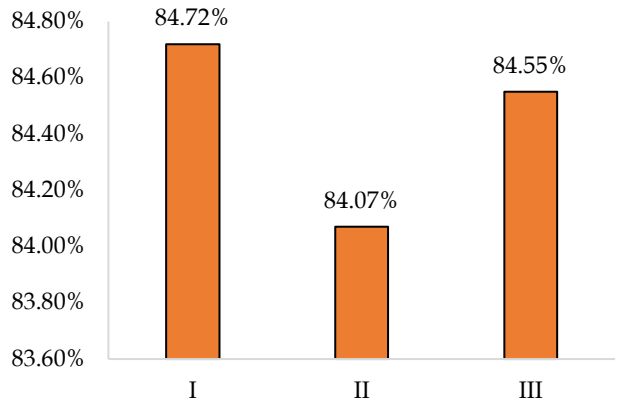

Figure 8. Graph of the percentage of being critical thinking attitude aspects

Aspect of Being Responsibility Attitude

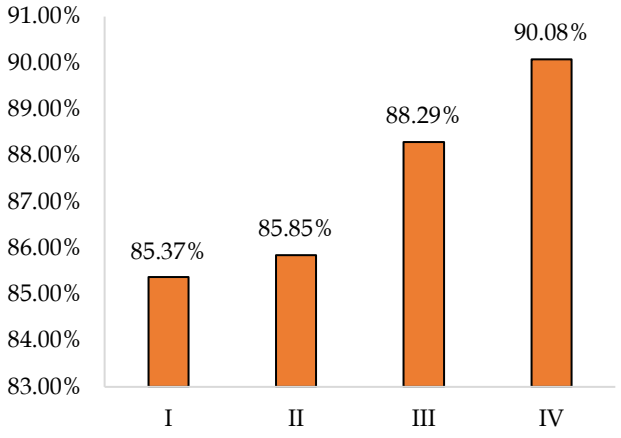

Figure 9. Graph of the percentage of being responsibility attitude aspect

The curiosity attitude aspect has an average score of 87.55% with very good criteria. The curiosity attitude aspect consists of 3 indicators with a total of 9 questions. The indicators that reflect an attitude of curiosity are students often ask questions which have an average score of 89.00% in the very good category, observing those who have an average score of 86.72% in the very good category, and enthusiasm which has an average score of 86.94% by category Very good. Obtaining indicator values from the aspect of curiosity attitude which reflects the scientific attitude of students when carrying out practicum can be seen in Figure 2.

High curiosity towards new concepts being studied is one of the scientific attitudes reflected in students. This is in accordance with Emda's (2017) statement that to generate learning motivation and encourage curiosity can be done through experimental or practicum activities which can support students to discover knowledge through exploration.

The honesty attitude aspect has an average score of 8.3 % with good criteria. The honesty attitude aspect consists of 3 indicators with a total of 4 questions. The indicators that reflect an honesty attitude are Writing down the results of observations as they are, which has an average score of 85.37% in the very good category. Not seeing the results of other people's observations, which has an average score of 83.53% in the good category, and Accepting the reality of the observations obtained, which has an average score of 81.54% in the good category. Obtaining indicator values from the aspect of honesty attitude which reflects the scientific attitude of students when carrying out practicum can be seen in Figure 3.

The honesty aspect is a characteristic that is needed when working in groups on observation activities and experimental activities (Hasbiyati et al., 2022). The honesty attitude aspect is important for education in the 2nd century 1 to support character education for students. According to the Kemendikbud (2018), regarding strengthening character education, an honesty attitude is stated to be one of the important attitudes that students must have in order to become human beings with noble character.

However, the reality in the field is that many students still find low levels of honesty attitude. The student's are still not confident enough to answer the questions according to the knowledge they have (Afifah et al., 2022) and also fear of failure in practicum results. One of the efforts that can be made to students who are going to do practicum is to provide confidence that research data does not always have to be good, so that whatever results they get, those are actually the best results. With positive motivation expressed like that, students will feel confident (Kristiani et al., 2021) to attach their research data as is without having to manipulate the data.

The objectify attitude aspect has an average score of 8.5.85% with very good criteria. The objectify attitude aspect consists of 2 indicators with a total of 2 questions. The indicators that reflect an honesty attitude are Paying attention to and evaluating statements made by other parties, which has an average score of 82.43% in the good category, and Paying attention to all processes and conclusions, which has an average score of 89.26% in the very good category. Obtaining indicator values from the Objectify attitude aspect which reflects students' scientific attitudes when carrying out practicum can be seen in Figure 4.

An Objectify attitude means viewing something according to its place, nature and circumstances. Suryandari (2016) said that, this objectify attitude is an

attitude science that always has to be cultivated and maintained by students from an early age because this attitude is one of the characteristics of a scientist, especially a chemist (chemical character).

The perseverence attitude aspect has an average score of 85.96 % with very good criteria. The Perseverence attitude aspect consists of 3 indicators with a total of 3 questions. The indicators that reflect a Perseverence attitude are not giving up when carrying out practical activities, this indicator has an average score of 89.11% in the very good category. The habit of repeating data (practicum), has an average score of 82.76% in the good category. And carrying out practicum activities until completion , which has an average score of 86.02% in the very good category . Obtaining indicator values from the Objectify attitude aspect which reflects students' scientific attitudes when carrying out practicum can be seen in Figure 5.

Attitude scientific become Wrong one determining factor success Study Students, with the ability to have a good scientific attitude, will give rise to better learning activities and causes students to be more Perseverence as well active in learning, with activity these students will get better learning outcomes than students with low scientific attitude abilities (Putri et al., 2017).

The conscientious attitude aspect has an average score of 8.5.65 % with very good criteria . The conscientious attitude aspect consists of 4 indicators with a total of 4 questions. The indicators that reflect a conscientious attitude are Paying attention to empirical facts, the average score is 86.02% in the very good category. Be Conscientious and careful in carrying out practicum, which has an average score of 86.83% in the very good category. Postpone decisions until sufficient data is collected, which has an average score of 82.76% in the good category. And Work according to established procedures, which has an average score of 86.99% in the very good category. Obtaining indicator values from the Objectify attitude aspect which reflects students' scientific attitudes when carrying out practicum can be seen in Figure 6.

The high score of students' accuracy in practicum activities explains that practicum activities can increase students' accuracy. This is supported by research conducted by Djufri et al. (2018) that the implementation of learning based on practical work will have a higher influence on student accuracy than conventional learning.

The oppeness attitude aspect has an average score of 87.56% with very good criteria. The Openness attitude aspect consists of 4 indicators with a total of 4 questions. The indicators that reflect an Openness attitude are Willing to listen to other people's arguments, this indicator has an average score of 85.04% in the very good category. Collaboration in practicum, which has an average score of 87.32% in the very good category. Willing to change opinions based on strong evidence, this indicator has an average score of 87.64% in the very good category. and Appreciating the work of others, which has an average score of 90.24% in the very good category. Obtaining indicator values from the Openness attitude aspect which reflects students' scientific attitudes when carrying out practicum can be seen in Figure 7.

The Openness attitude can be seen from the answers of students who are accustomed to listening to other people's arguments, respecting other people's work even though these ideas conflict with their own findings. Meanwhile, if someone else's idea has enough data to support that idea, they don't hesitate to reject their own findings. This is in line with Fatonah et al. (2014) who state that someone who has an Openness-minded attitude will be able to respect other people's opinions, be willing to change opinions if there is a lack of data, accept other people's suggestions, and not feel like they are always right.

The Being critical thinking attitude aspect has an average score of 84.44% with good criteria. The Being critical thinking attitude aspect consists of 3 indicators with a total of 3 questions. The indicators that reflect a Being critical thinking attitude are seek as much information as possible, this indicator has an average score of 84.72% with a good category does not ignore data even though it is small, which has an average score of 84.07% in the good category and does not immediately accept conclusions without strong evidence, which has an average score of 84.55% in the good category. Obtaining indicator values from the Being critical thinking attitude aspect which reflects students' scientific attitudes when carrying out practicum can be seen in Figure 8.

In the process of scientific attitudes, being critical thinking really influences learning outcomes, because students' Being critical thinking will improve their thinking patterns so that it can have an impact on their learning outcomes. Obtaining quite good scores in the Being critical attitude aspect reflects that a Being critical attitude is important to support a high scientific attitude. Matter this in line In the opinion of Mawadatin (2020), high Being critical thinking skills will produce a high scientific attitude.

The Being responsibility attitude attitude aspect has an average score of 87.39% with very good criteria. The aspect of responsiveness consists of 4 indicators with a total of 4 questions. The indicators that reflect an attitude of responsibility are Courageous maintain an opinion on the results of the practicum, this indicator has an average score of 85.37 % in the very good category. Not taking

practicum seriously, that is has an average score of 85.85 % in the very good category. Collecting reports and practical assignments on time, this indicator has an average score of 8 8.29 % in the very good category. And cleaning materials and practical equipment, namely has an average score of 90.08 % in the very good category. Obtaining indicator values from the aspect of Being responsibility attitude which reflects the scientific attitude of students when carrying out practicum can be seen in Figure 9.

Obtaining a high score in the Being responsibility attitude aspect means that learning can take place well and smoothly, for this reason, a Being responsibility attitude must be possessed and instilled in every student. It is very important for students to have an attitude of responsibility, this is in line with the opinion Sardinah et al. (2012), some aspect Scientific attitudes can be developed and instilled in students, one of which is a Being responsibility attitude.

Acquiring a scientific attitude obtained from the analysis that has been described can be said that practical-based chemistry learning can develop students' scientific attitudes because learning requires students to be directly involved in scientific activities. So the category of all aspects of scientific attitude is in the good category.

Students who have a high scientific attitude are more receptive to active learning, students' scientific attitude is facilitated by experimental activities that arouse students' curiosity. Students design tools, carry out experiments, observe experiments showing that students are Being responsibility for the tasks given. Students are honest in writing down experimental data. When discussing the results of the experiment and concluding the concept, they found that Opennessness and respect for others played an important role. All these sequential processes enable students to solve problems in learning so that student learning outcomes increase (Purwanti et al., 2015). According to that Capriconia et al. (2022) students' attitudes correlate with students' conceptual understanding, because overcoming students' understanding also overcomes the difficulties faced by students (Jamaludin et al., 2021).

Suggestions that can be given are based on research results that every chemistry teacher in teaching is expected to pay more attention to the scientific process and scientific attitudes of their students. Because of the challenges of the future, these two things are really needed in everyday life.

Conclusion

The scientific attitude in the aspect of curiosity has a score of 87.55% with very good criteria, the honesty attitude has a score of 83% with good criteria, the Objectify attitude has a score of 85.85% with very good criteria, perseverance has a score of 85.96% with very good criteria, conscientiousness has a score of 85.65% with very good criteria, Openness attitude has a score of 87.56% with very good criteria, Being critical thinking has a score of 84.44 % with good criteria, responsibility has a score of 87.39% with very good criteria. Overall, students' scientific attitudes through chemistry practicum activity experience achieved a score of 75.37% with good criteria.

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Author Contributions

Conceptualized the research idea, analyzed the data, coordinated the implementation of research activities and wrote the article, N.I.A. Guided and validated the instruments used in the research, N.A. Helped formulate the research methodology design and assisted with data analysis, S.S.D.

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Conflicts of Interest

The authors declare no conflict of interest.

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