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Metacognitive Assessment Profile of Prospective Chemistry Educators

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Abstract

Metacognitive awareness (MA) plays an important role in classroom learning as it enhances self-teaching capabilities on students. Therefore, it is necessary to know the level of awareness possessed by a teacher. This study aimed to describe the metacognitive awareness profile of prospective chemistry educators. The method of research is descriptive quantitative using survey methods. The participants consisted of students undergoing their final semester. The instrument used was the MAIT-18 (Metacognitive-Awareness Inventory for Teachers-18). This instrument has two indicators, specifically cognitive knowledge and regulation. The results showed that students had a good level of cognitive knowledge and regulation with 80% and 77%, respectively. Therefore, the overall percentage of metacognitive awareness obtained was 80%. These results suggest that prospective chemistry educators have a good awareness of metacognitive. This indicates they can influence positive things on students, foster autonomy in teaching and learning, also can be an asset to be an effective teacher.

Keywords: cognitive knowledge, cognitive regulation, metacognitive awareness, prospective chemistry educators

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1. Introduction

Education has a role as a means of acquiring knowledge. Through education, one can improve the quality of life and give a deeper meaning. However, that quality cannot be achieved if one is unable to reflect on the meaning of education within him. Therefore, metacognitive awareness is vital to every individual.

Flavell et al. (2002) stated that metacognitive is thinking about thinking or knowing about knowing. Metacognitive refers to our awareness of the learning process. Learning requires metacognitive awareness because of the importance of an individual's understanding of cognitive processes and the ability to control such as knowledge about oneself and the task, skills in using metacognitive strategies, the ability to recognize when and why to use certain strategies (Veenman et al., 2006). Teachers' metacognitive awareness is a symbol of the level of self-awareness and self-regulation in teaching activities (Jiang et al., 2016). Therefore, one important component to foster autonomy in teaching and learning is metacognitive awareness.

The ability to recognize one's perceived weaknesses and utilize them as an assessment in an effort to develop new cognitive abilities is crucial for learning success. Metacognitive awareness plays a crucial role in thinking and learning, with the presence of metacognitive consciousness can make an individual more effective and (Muhali, 2013). Metacognitive

has a very important role to play in achieving learning success, because it allows individuals to manage their thinking more effectively and identify vulnerabilities so that it can be improved by building new cognitive skills (Sarıcoban, 2015). The importance of metacognitive teaching and learning is necessary for self-teaching when aimed at achieving learning success in further study and in learning (Kallio et al., 2018).

As students are required to actively prepare themselves, assess their own capacities, and overcome obstacles in the learning process, metacognitive awareness becomes essential in the context of learning. Students can become aware of and assess their grasp of the subject being taught by using metacognitive awareness. The objective is to assist pupils in thoroughly grasping the content. Students' self-awareness of their metacognitive assists them in identifying their own shortcomings and motivating themselves to develop for better content mastery (Riyadi, 2022). Additionally, the metacognitive is crucial for learning chemistry since it helps students understand how different levels of chemical events are related to one another (Parlan et al., 2022).

One of the standards that prospective educators must have is metacognitive awareness, which requires competence in attitudes, knowledge, and skills, including metacognitive knowledge. When teachers take into account the unique qualities of each student and design their activities effectively to improve metacognitive knowledge and skills, students' metacognitive awareness can be a useful tool. Regarding pupils as the objects of their own cognitive activity, this is crucial (Balashov et al., 2021). Because emphasizing meta-cognitiveness in the classroom is a worthwhile and successful way to improve academic achievement, the role of teachers in fostering this awareness cannot be understated (Smith et al., 2020).

The importance of metacognitive consciousness is also supported by some research findings. Firmansyah & Hendra (2019) According to study, mathematical problem-solving abilities and metacognitive awareness are strongly correlated. The findings support the crucial part that metacognitive consciousness plays in learning. By allowing people to gauge their level of understanding of the information they are studying and helping them to quickly spot learning gaps, metacognitive skills play a crucial role in enhancing the learning process (Safitri et al., 2020). Metacognitive abilities can help in considering appropriate, careful, logical, systematic decision-making from different perspectives. Teachers with strong metacognitive skills will be driven to keep raising their game and developing their abilities. They frequently assess and consider how to educate them in order to make it pleasant for the pupils' learning styles. Therefore, it may be said that metacognitive is crucial for teachers as well as students (Fauzi & Sa'diyah, 2019).

Another study by Abdellah (2015) established a link between female teachers' teaching effectiveness and metacognitive awareness. Additionally, there is a favorable correlation between metacognitiveness and academic success. Other research by Huseyin (2016) discovered a connection between learning desire, academic consciousness, and metacognitive awareness. Knowledge and cognitive regulation have a significant contribution to the motivation of learning, especially in teacher education. Based on a study conducted by Sarıcoban (2015) it was found that in the study, candidate teachers showed a positive attitude towards metacognitive consciousness in the context of learning. They have an understanding of various cognitive aspects, such as knowledge of how to do something, knowledge of facts and information, and knowledge of the conditions that influence learning. Besides, they are also able to regulate and control their cognitive processes, including in terms of information management, identifying and correcting errors, planning, understanding, monitoring, and evaluation. They also have an awareness of learning strategies that are effective for themselves, are able to recognize their intellectual strengths and weaknesses, and also show intrinsic motivation that comes

from themselves. This study demonstrates the benefits obtained when a person is aware of the metacognitive abilities they possess, as is the case with future teachers in the study.

A person's awareness of the metacognitive capabilities he possesses, such as in learning strategies, monitoring, understanding, and assessment of learning, is called metacognitive consciousness. Metacognitive awareness has important aspects that consist of knowledge and regulation. Knowledge includes declarative understanding, procedural skills, and knowledge of situations, while regulation involves planning, monitoring, and evaluation. Metacognitive awareness is a very important ability for students who are in the process of becoming prospective teachers (Wardana et al., 2021). According to Sudirman & Yusnaeni (2020) metacognitive has an important role in student thinking, therefore learning by empowering metacognitive abilities is imperative to be done by teachers in the right learning strategy to get learning results according to what is expected.

Ainun et al. (2019) research entitled "Students' Metacognitive Awareness Profile in a Private High School in Sragen" used the MAI (Metacognitive Awareness Inventory) instrument developed by Schraw and Dennison (1994). Sholihah & Sofiyana's (2022) research uses the Metacognitive Awareness Inventory (MAI) instrument developed by Schraw dan Dennison (1994). The population in this study were all students at FKIP Balitar Islamic University who were still actively attending lectures, which are students from year I to year IV. The difference between this research and previous research is that it uses an instrument specifically for teachers that has been developed, which is the Metacognitive Awareness Inventory for Teachers-18 (MAIT-18) developed by Kallio et al. (2017).

Chemistry education students are students who are specially prepared to pursue knowledge and skills in the field of chemistry with the aim of becoming chemistry educators or teachers. They are prospective educators who are preparing to provide learning at primary, secondary or higher education levels. Upon completion of their preparation, prospective chemistry education teachers are expected to have the skills, knowledge, and attitudes necessary to provide meaningful and effective instruction in the subject of chemistry. To support this, chemistry education students are not only equipped with chemistry material but also equipped with educational & teaching knowledge.

As prospective teachers, chemistry education students must have metacognitive awareness which is being able to help students solve problems that students may face more easily. Teachers are also examples for students in applying knowledge and cognitive regulation. Therefore, teachers who expect students to have good metacognitive awareness must also have good metacognitive awareness (Yıldız & Akdağ, 2017). The positive impact which students get if teachers have good metacognitive awareness is also revealed in Cihanoglu (2012) research, meaning that students must be given activities that require them to be aware of what they know, plan what they need. they learn, and monitor their strategy choices, so they can become independent learners.

This research aims to provide a description of the metacognitive awareness profile of Chemistry Education students class of 2019 at Tanjungpura University as prospective teachers. It is hoped that this research can obtain information regarding the metacognitive awareness that students as prospective teachers have so that they can evaluate themselves and improve their teaching skills in the future. This description is carried out by calculating the percentage of metacognitive awareness indicators and creating categories based on these results.

2. Research Method

This type of research is quantitative descriptive. The method used is a survey method with a questionnaire as a tool for collecting data. The questionnaire was adapted to the MAIT-18 (Metacognitive

Awareness Inventory for Teachers-18) instrument developed by Kallio et al. (2017) from MAIT. The research population is chemistry education students with a sample of chemistry education students class of 2019. The sampling technique used purposive sampling because researchers wanted to know the level of metacognitive awareness of prospective teachers so they used final semester students who already had teaching experience during Field Experience Practices at school. So the research subjects consisted of 48 students from the Chemistry Education study program who were taking their final semester. This research is aimed at chemistry education students to find out how aware students are in teaching chemistry during Field Experience Practices but it is not related to the material. Respondents to this survey were contacted online using a Google form. In order to provide information or improve the facts regarding the main justifications for the remarks most students made, interviews were performed.

The instrument in this research was adopted from the Metacognitive Awareness Inventory for Teachers-18 (MAIT-18) developed by Kallio et al. (2017), which was originally an adaptation of the Metacognitive Awareness Inventory for Teachers (MAIT) developed by Balcikanli (2011). Meanwhile, MAIT itself is an adaptation of the Metacognitive Assessment Inventory (MAI) developed by Schraw & Dennison (1994). The adaptation of the MAI instrument into MAIT aims to help teachers who practice teaching to realize their metacognitive level in teaching.
By condensing the MAIT questionnaire and attaining a suitable factor structure, the MAIT-18 instrument development intends to adapt the instrument items. The Procedural Knowledge factor item "I try to use teaching techniques that have been successful in the past" was eliminated from MAIT-18 since it had a negligible connection with the other items in the factor. Item "I have control over how well I teach" from the Declarative Knowledge category was eliminated because some participants thought it was a challenging statement. The word "effectiveness" is used in the conditional knowledge factor items "I know when each teaching technique I use will be most effective" and "After teaching one point, I ask myself whether I will teach it more effectively next time" Since some participants found it difficult to answer to the statement, the concept of evaluating was eliminated from this instrument. Additionally, the Planning factor item "I ask myself questions about the teaching materials I will use" had an incorrect value and was consequently removed. The researchers found the item "I ask myself about how well I teach" to be ambiguous and decided it was not the right item to use to gauge monitoring.

The instrument used has been tested for validity and reliability by Kallio et al. (2017). By calculating Cronbach's Alpha for the MAIT-18 compressed questionnaire, one may determine internal consistency. The internal consistency of the individual parts and the entire questionnaire was determined to be good, if not excellent. The MAIT-18's final Confirmatory Factor Analysis (CFA) results showed that the factor structure fit was good to satisfactory. The MAIT-18 instrument consists of 18 statements with four possible responses on a Likert scale. 18 statements make up the MAIT-18 instrument, which is scored using a Likert scale with four possible responses. The questionnaire format uses a point Likert type response, where neutral points are removed so that respondents give clear answers whether they agree or disagree, thereby avoiding ambiguous answers. The rating scale used is as follows: Strongly Disagree (1), Disagree (2), Agree (3), Strongly Agree (4).

Table 1. Indicator of Metacognitive Awareness Inventory for Teachers-18 (MAIT-18)

Metacognitive Awareness Indicator	Declaration Number	Amount
Cognitive Knowledge		
Declarative Knowledge	1, 2, 3	3
Procedural Knowledge	4, 5, 6	3
Conditional Knowledge	7, 8, 9	3
Cognitive Regulation		
Planning	10, 11, 12	3
Monitoring	13, 14, 15	3
evaluating	16, 17, 18	3

(Kallio et al., 2017)

The resulting data were analyzed with descriptive statistics using the percentage formula and then categorized. Categorization aims to collect information about students' metacognitive awareness.

Percentage of metacognitive awareness (PMA):

$$PMA = \frac{\sum score}{\sum item \times Bmax \times N} \times 100\% \quad (1)$$

Description:

PMA	=	Percentage of metacognitive awareness
∑score	=	Total score
∑items	=	Total items of the questionnaire
Bmax	=	Maximum weight value for each questionnaire item
N	=	Total number of participants

(Angraini & Kerinci, 2021)

The following categories of metacognitive awareness among prospective teacher students:

Table 2. Categories of Metacognitive Awareness

Score Interval (%)	Category
82-100	Very Good
63-81	Good
44-62	Adequate
25-43	Insufficient

3. Result and Discussion

3.1. Profile of Metacognitive Awareness

Teacher metacognitive awareness refers to teachers' ability to understand and manage their own teaching and learning processes, as well as recognizing strengths and weaknesses in the teaching methods and learning strategies used. Teachers' metacognitive awareness has important value because it allows them to be more effective teachers and have a good influence on students. The data on the results of the metacognitive awareness of chemistry education students as prospective teachers is presented below.

Table 3. Metacognitive Awareness

Metacognitive Awareness Indicators	Average	Category
Declarative Knowledge	81%	Good
Procedural Knowledge	79%	Good
Conditional Knowledge	80%	Good
Planning	81%	Good
Monitoring	77%	Good
evaluating	74%	Good
Mean Metacognitive Awareness	79%	Good

Based on the data from Table 3, the average level of metacognitive awareness of students as prospective teachers is 79% in the good category. This means that students' metacognitive awareness is good. Metacognitive awareness allows student teachers to understand the extent to which they have mastered learning material, identify areas that require deeper understanding, and understand how their knowledge can be effectively conveyed to students. This means that with the results of good metacognitive awareness, prospective chemistry teacher students have been able to master and convey clearly and precisely an understanding of atomic structure, properties of chemical elements and chemical reactions and can identify their understanding more deeply. This is supported by the results of interviews that students know and understand their own strengths and weaknesses in teaching (declarative knowledge), have awareness of the thinking process (procedural knowledge), use learning techniques according to their conditions (conditional knowledge), have a learning plan, carry out monitoring on students, can evaluate and improve learning better. This is in line with research conducted by Sarıcoban (2015) that teachers who have a positive attitude towards metacognitive awareness in the learning process have an understanding of metacognitive knowledge such as declarative knowledge, procedural knowledge and conditional knowledge. Apart from that, it also has learning planning, monitoring and evaluation.

Teachers who have good metacognitive awareness can support good learning outcomes for students. To get students with

good metacognitive awareness in learning, teachers with good metacognitive awareness are needed so as to produce students with metacognitive awareness who can improve learning outcomes. According to Pillena et al. (2019) students who have metacognitive awareness can evaluate their own thinking processes based on the experiences they have had, this can reduce the possibility of errors occurring to students in solving problems and can help students to identify good learning strategies in order to improve learning Good.

3.2. The Profile of Cognitive Knowledge Indicators

Each metacognitive awareness indicator has interrelated sub-indicators. In particular, there is a close relationship between declarative knowledge and procedural knowledge. When someone realizes that they do not understand something, they will develop other strategies according to existing needs. These efforts are part of procedural knowledge. Procedural knowledge is considered as the implementation or application of a person's declarative knowledge. Procedural knowledge and conditional knowledge are closely related because they relate to the teaching strategies used. When someone has a good understanding of the necessary teaching strategies, they should also understand why and when it is appropriate for those strategies to be used. If someone has been able to apply a teaching strategy in a certain situation, it shows that they also have knowledge about how to use teaching strategies effectively. This shows that there is a connection between procedural knowledge and conditional knowledge in the teaching context (Adhitama et al., 2018). Metacognitive knowledge in optimal learning can help learning outcomes be better in terms of scientific attitudes and thinking (Ardhana, 2020). The percentage level of awareness of cognitive knowledge is presented in Figure 1.

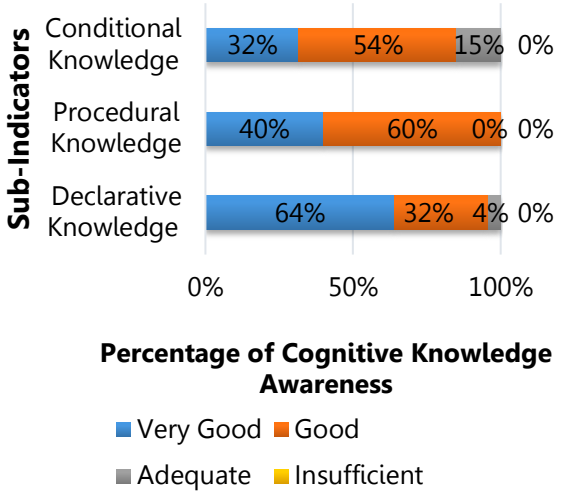

Figure 1. Percentage of Cognitive Knowledge Awareness Levels (N=48)

3.2.1. Sub-Indicator of Declarative Knowledge

Declarative knowledge is knowledge about something. Declarative knowledge includes knowledge about ourselves and the factors that influence our knowledge (Ainun et al., 2019). Involves students' understanding of themselves and the factors that influence their knowledge. Declarative knowledge is used to describe the extent to which students recognize themselves as prospective teachers. Based on Figure 1, the results for the sub-indicator of declarative knowledge awareness are 64% very good and 32% good. Declarative knowledge refers to the type of knowledge that elucidates facts or information, aiding in the comprehension of chemical concepts and phenomena. These findings indicate that prospective chemistry teachers possess a commendable understanding and retention of information concerning fundamental chemical facts and concepts, such as the ideal gas law, atomic numbers, and the law of conservation of mass. Proficiency in this regard is crucial for effectively delivering instructional content to students, as educators with a profound understanding can articulate these concepts in a manner easily comprehensible to students.

The results of declarative knowledge which are classified as good are supported by the results of interviews, that students understand their strengths and weaknesses and can balance

their weaknesses. This is in line with Sumadyo & Purwantini (2018), which stated that someone who has high declarative knowledge will know their strengths and weaknesses. After knowing the shortcomings in teaching, students can anticipate failures in teaching and can improve subsequent learning. However, there are 4% results in the sufficient category because based on the interview results, some students do not yet recognize knowledge about themselves (declarative knowledge) such as not knowing their strengths or weaknesses in teaching but trying to do the best they can in teaching so that there are no shortcomings in teaching.

3.2.2. Sub-Indicator of Procedural Knowledge

Procedural knowledge involves awareness of thought processes or knowledge of how to achieve goals and carry them out. Someone who has high procedural knowledge is able to use various strategies to overcome problems. Based on Figure 1, the procedural knowledge sub-indicator awareness results are 40% very good and 60% good. Procedural knowledge in chemistry includes the steps or procedures for carrying out a chemical action or experiment. This procedural knowledge provides practical guidance on how to carry out specific tasks in a chemistry laboratory or chemical research context. Based on these results, it shows that prospective teacher students can have a good understanding of carrying out procedures or commonly known as practical work such as separating mixtures, making solutions, synthesizing organic compounds and compound extraction.

There are no sufficient or insufficient results because the results of good procedural knowledge data are supported by interview results, that students understand the teaching techniques used, can understand and use teaching techniques that are useful in learning and can choose appropriate procedures in solving problems. This is in accordance with the opinion of Haryanti et al. (2013), which is that someone has procedural knowledge if they are able to apply and choose appropriate and appropriate procedures in solving problems.

3.2.3. Sub-Indicator of Conditional Knowledge

Conditional knowledge reflects an understanding of why and when to use a strategy in learning (Widodo, 2015). Conditional knowledge plays a very important role in allocating sources of information obtained selectively and using strategies effectively. Conditional knowledge has another role, which are to improve and change the conditions to be achieved in each lesson (Rinaldi, 2017). Conditional knowledge is very important for a teacher because the teacher must be able to create a learning atmosphere that makes students active in constructing or building their own knowledge (Junita, 2015). Based on Figure 1, the conditional knowledge sub-indicator awareness results are 32% very good and 54% good. Conditional knowledge involves understanding cause-and-effect relationships or specific contexts that influence a particular statement or situation such as helping to understand how various factors can influence behavior and outcomes in a chemical context. Based on these results, it shows that student teachers can have a good understanding regarding the factors that influence certain situations in chemistry such as reaction rates, reaction balances, gas pressure, aerobic respiration and other chemical equilibria.

The results of this good conditional knowledge data are supported based on interview results, that students know what kind of teaching techniques are appropriate to the required conditions and can determine useful methods for better learning according to the circumstances. This is in line with what was stated by Tanti et al. (2018) conditional knowledge refers to understanding when exactly we should apply a procedure, skill or strategy, and when it is best not to use it. This involves understanding why a procedure may be used in a particular situation, what conditions favor its use, and the reasons why it is more effective than others. This knowledge is very important because someone who has high procedural knowledge has a goal for each teaching technique used to be able to understand and use learning techniques, a lack of procedural knowledge

can lead to a lack of ability in choosing the right learning techniques to use (Kodri & Anisah, 2020). However, there were 15% results in the sufficient category because based on the interview results, several students only used teaching techniques that they really mastered and did not use different teaching techniques depending on the conditions and situation. This is because if you use a teaching technique that they have mastered, then students understand and comprehend it, they will continue to use that technique.

3.3. Profile of Cognitive Regulation Indicators

Cognitive regulation indicators consist of interrelated planning, monitoring and evaluation sub-indicators. Planning involves the individual's ability to design the actions necessary to achieve learning goals, including identifying goals, determining strategies, and appropriate allocation of resources. Monitoring involves monitoring ongoing cognitive processes and awareness of progress that has been made. Evaluation involves assessing the results that have been achieved and the progress that has been made. These three sub-indicators support each other in cognitive regulation, where planning helps direct cognitive processes, monitoring monitors progress so that it can be achieved, and evaluation helps measure the effectiveness of strategies and steps that have been taken. These three interrelated aspects can help individuals manage their thoughts, feelings and behavior to achieve set goals. Figure 3 shows the percentage level of regulatory awareness regarding cognition obtained by students as prospective teachers.

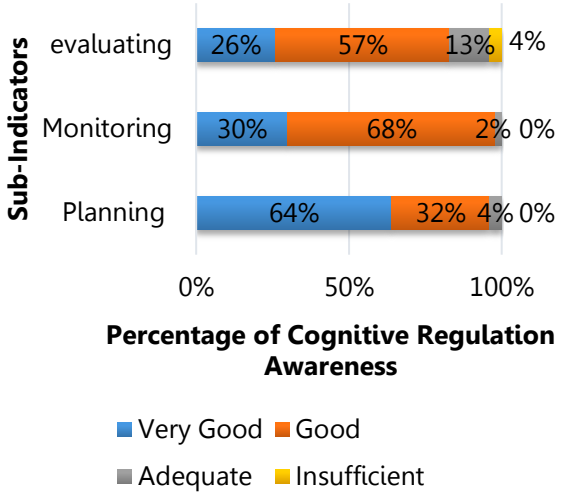

Figure 2. Percentage of Cognitive Regulation Awareness Levels (N=48)

3.3.1. Sub-Indicator of Planning

The planning process involves designing problem solutions that are appropriate to the problems faced. Plans are developed to solve or reduce existing problems.

Based on Figure 2, the results of planning sub-indicator awareness are 64% very good and 32% good. Planning in chemistry involves developing strategies to design and carry out chemical experiments or processes efficiently and effectively. Based on these results, it shows that prospective chemistry teacher students can have a good understanding in planning learning, such as before carrying out the practicum, they must know and organize each step. Any planning of experiments in chemistry must consider factors such as safety, precision of measurements, and validity of results. Good planning ensures experiments are conducted efficiently and provide reliable results.

The results of this good planning indicator data are supported based on the results of interviews, that students have good planning before learning, even in detail with estimated time estimates at each stage of teaching, students can manage time well to achieve learning goals, have certain targets in teaching that can support students' success in learning. These results are in line with Iskandar (2014) that planning involves setting goals, relevant

time management, and selecting appropriate and effective strategies. However, there were 4% results in the sufficient category because based on the results of interviews, several respondents had planned before learning but it was not in accordance with the planning, such as it was difficult to manage time to be more efficient because the estimated time often did not match the plan and there was always a lack of learning but not enough learning time. Only the final parts of learning provide motivation for learning.

3.3.2. Sub-Indicator of Monitoring

Monitoring is used to measure the extent to which students are aware of things they have not mastered (Adhitama et al., 2018). Based on Figure 2, the monitoring sub-indicator awareness results are 30% very good and 68% good. Monitoring in chemistry involves monitoring and evaluating the content or topics taught to ensure understanding and achievement of learning objectives. Based on these results, it shows that prospective chemistry teacher students can have a good understanding in carrying out supervision such as monitoring overall class performance, reviewing and ensuring that the lesson material covers all the important concepts that students must learn and can compose and give exams or questions. exercises that cover the chemistry material taught. Analyze the results to understand the student's level of understanding.

The results of good monitoring indicator data are supported based on interview results, that students always check the development of student understanding during each lesson. Monitoring is carried out by looking at student expressions, direct questions or in the form of practice questions. According to Ainun et al. (2019) good monitoring is monitoring that can produce correct confirmation of students' understanding. These results are in line with the results of interviews where prospective teacher students said that by checking students' understanding by means of direct questions and giving questions, they could determine the level of students' understanding. These good monitoring results show that students have the ability to understand and manage the lesson material presented (Maswandi, 2015). However, there are 2% results in the sufficient category because based on the results of interviews, some students have carried out monitoring but not regularly because they only check students' understanding as a whole and at the end of the lesson with statements or practice questions because if they carry out regular monitoring the respondents need more time, whereas limited learning and often lack of time.

3.3.3. Sub-Indicator of Evaluation

Evaluation of metacognitive awareness is a process for measuring and evaluating the extent to which a person has an understanding and awareness of his or her own cognitive processes, including thinking, understanding, learning strategies, and problem solving. Evaluations are carried out to gain a better understanding of the extent to which a person is able to monitor and organize their thinking, as well as identify strengths and weaknesses in the learning strategies used.

Based on Figure 2, the evaluation sub-indicator awareness results were 26% very good and 57% good. Evaluation in chemistry material involves assessing and measuring students' understanding of chemical concepts, practical skills, and application of knowledge in a chemical context. Based on these results, it shows that prospective chemistry teacher students can have good assessments and measurements in assessing students' understanding, such as giving written exams to measure understanding of chemical concepts, measuring students' practical skills through practicums and laboratory experiments, and being able to involve students in the assessment process among themselves, where they provide feedback on classmates' performance and understanding in the context of chemistry learning.

The results of the evaluation indicator data are classified as good. This is supported by the results of interviews after teaching students to evaluate the results of their own teaching by asking themselves about the achievement of the learning goals they previously targeted,

evaluating time management, evaluating the teaching techniques used and evaluating learning methods and understanding results. student. This is in line with Sitompul (2022) research, which stated that students evaluate by making personal self-reflections on the learning carried out at each stage. However, there were sufficient results of 13% and less than 4% because based on the results of interviews, some students did not carry out personal evaluations because they only looked at whether the students understood the learning results or not.

4. Conclusion

Based on the study's findings, it can be said that chemical education students generally have a high level of metacognitive awareness. This is influenced by each indicator and sub-indicator's results, which have an average outcome that is considered good. These results indicate that chemistry education students as prospective teachers have a positive attitude towards metacognitive, enabling them to become more effective teachers and have a good influence on students.

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