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| RESEARCH ARTICLE

Planning of Metacognitive Strategy-Based Natural Sciences Learning in Elementary Schools

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| ABSTRACT

The present study aimed to explore the antecedent planning of metacognitive strategy-based natural sciences learning in elementary schools in Gorontalo City. It employed an evaluative descriptive approach and the Stake's Countenance evaluation model. The research subjects were the teachers of the selected elementary schools. Further, the data was collected through observation, study documentation, and interviews. Meanwhile, the data analysis technique in this study was carried out in a qualitative descriptive manner. The qualitative data were analyzed using thematic analysis by comparing data at one stage of the Countenance Stake model. The study found that the metacognitive strategy-based lesson plan arrived at the "adequate" category (68.90%).

| KEYWORDS

Metacognitive strategies, strategy-based lesson plan, natural sciences learning, elementary school

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1. Introduction

Students' success in the learning process is influenced by their thinking process capacity, often referred to as metacognition. In the simplest sense, metacognition is defined by Flavell (1976) as a process of "thinking about thinking", i.e., an activity to consciously control one's own cognitive processes. Metacognitive activities include the thinking activity to plan, monitor, and reflect on how to solve a problem. Metacognitive strategies refer to the methods to increase awareness of the thinking and learning processes; when one is aware of his/her own thought process, his/her metacognitive skills will arise. Metacognitive skills are essential to be mastered by students as a process carried out in completing or carrying out tasks (Siregar, 2019).

The notion of metacognition, as written previously, urges the call for a learning strategy that is able to train and develop students' metacognitive skills. Students who are skillful in metacognitive strategy will be able to plan, monitor, and reflect on their learning process, resulting in increased self-confidence, self-reliance, and learning performance and outcomes.

The integration of metacognitive skills in students' learning process is emphasized in the concept of the Pendidikan Merdeka Belajar (lit. "Freedom to Learn" Education) program proposed by the Indonesian Ministry of Education and Culture in 2019. The concept is proposed as a response towards the need for an education system in the 4.0 industrial revolution era. Merdeka Belajar program calls for the independence of thinking, in which the success of this aspect is dependent on the teacher's performance (Romadhon, 2021). In addition, Mardhiyah et al. (2021) state that education in the 21st century focuses on the student-centered approach that aims to develop students thinking skills in;1) critical thinking, 2) problem solving, 3) metacognition, 4) communication, 5) collaboration, 6) innovation and creativity, and 7) information literacy.

Teachers and students are expected to apply metacognitive knowledge, by which students will know that they actually know something and know that they actually do not know something. Desmita (2012) asserts that metacognitive is the knowledge and

awareness of the cognitive process, or the knowledge of the mind and how it works, in which a curiosity arises because students use their cognitive processes to think about their own processes. Students can guide their own selves in setting the atmosphere and selecting strategies to improve their metacognitive abilities in the future.

The result of a preliminary observation in an elementary school in Gorontalo City highlights the lack of creative and innovative learning management that can facilitate the actualization of the Merdeka Belajar concept. It also points out several problems in learning management, particularly in the natural sciences learning. First, the application of innovative learning models was far from optimal. It was worsened by the COVID-19 condition in which all students were instructed to study from home. This situation lowered their learning motivation. Thus, the delivery of core and basic competencies in the natural sciences learning were inoptimal. This calls for the implementation of metacognitive strategies in the learning process.

Second, there is a lack of implementation of learning media in the learning process. Learning media is useful for improving students' thinking process as a part of the intrapersonal communication information processing process. Someone who perceives something must go through the thinking process first. This thinking process needs to be controlled in order to attain the desired thinking product. In other words, metacognitive strategies are crucial.

Third, the implementation of Higher Order Thinking Skills (HOTS)-oriented learning is lacking. High-order thinking skills (HOTS) can be trained through the learning process in the classroom. By that, the learning process will be able to provide space for students to discover the concepts of activity-based knowledge. That being mentioned, activities in learning can encourage students to build creativity and critical thinking.

Corebima and Idrus (2006) consider that metacognitive strategy as strategies used by students in their learning activities. The results of research by cognitive psychologists found that the difference between students who were less intelligent and more intelligent was indicated by their metacognitive abilities. The metacognitive abilities of these students can be reinforced through training in learning strategies in school. Students who already have metacognition will perform better in using metacognitive strategies and become independent learners more quickly.

Based on the results of a survey conducted in January 2022 to teachers in elementary schools in the city of Gorontalo, 94% of the 67 respondents were aware that there are metacognitive aspects in learning, and 88% were "trying to apply metacognitive strategies in natural science learning". This shows that metacognitive-based science learning has been carried out in natural science learning in elementary schools in Gorontalo City.

This survey highlights a contrasting result with that of the preliminary observation conducted in an elementary school in Gorontalo City. Teachers were lacking in the mastery and teaching method of natural sciences subjects. Teachers commonly applied improper design of natural sciences learning based on the essence of the academic field. This resulted in misconceptions among students, a lack of care for their psychological condition for the entire class, and a lack of meaningful learning process. Most of the teachers faced difficulty in arousing students' interest in learning, particularly in facilitating students' curiosity regarding natural phenomena. Teachers were inoptimal in applying learning methods, determining the appropriate learning media and instruments, as well as instilling the correct concepts in students. The teachers often adopted a verbalistic style of teaching. This shows that the teachers were far from optimal in stimulating the metacognition of students.

An evaluation is important to see the implementation of science learning based on metacognitive strategies in elementary schools in Gorontalo City. The evaluation aims to measure the extent to which metacognitive-based science learning is implemented as a means to make further decisions (Hadi & Mutrofin, 2006). Evaluation that can assess the effectiveness of learning as a whole is very crucial. Therefore, it is necessary to have an evaluation that, in its development, pays attention to aspects as a whole.

This study adopts the Stake's Countenance evaluation model developed by Robert E. Stake (1967). This evaluation model focuses on two main things, namely description, and judgment, to compare the goal with the actual situation. This evaluation model employs three stages in observing the development of the program being implemented, namely antecedent (context), transaction (process), and outcome. This evaluation model is adopted to adjust the objective standards that were used as benchmarks so that they could be determined and adapted to the conditions in the field. Based on the previous stage-setting, this study aims to answer the question, "how is the antecedent planning of metacognitive strategy-based natural sciences learning in elementary schools in Gorontalo City?"

2. Methodology

This study took place in Gorontalo City. There are around 110 state and private elementary schools spread throughout the city. Ten representative schools in the city were selected as the sites of research by purposive sampling technique. The representative sampling involved several categories as follows: 1) accredited 'A' rank with the 'pioneering school' status, 2) accredited 'A' rank, and 3) accredited 'B' rank. The sampling mechanism was applied in order to evaluate the implementation of metacognitive strategy-based natural sciences learning.

The research subjects were the teachers of the selected elementary schools. The object of evaluation in this study was the antecedent planning of metacognitive strategy-based natural sciences learning in elementary schools. This research was conducted for three months, starting from February to April 2022.

This study employed an evaluative descriptive approach. An evaluative descriptive in program evaluation is used to collect, describe, and explain aspects that have been evaluated, compare the results with the set criteria, and draw conclusions or also referred to as the evaluation result.

This study also applied the Stake's Countenance evaluation model, i.e., an analysis of the evaluation process that emphasizes two types of operations, descriptions, and judgments, as well as in program evaluation, namely preparation (antecedent), which in this study included the planning metacognitive-based natural science learning in elementary school.

The research applied observation, study documentation, and interviews as the data collection techniques with research instruments of documentation assessment sheets, observation sheets, and interview sheets. The research instruments have passed the instrument validation process prior to being applied.

The data analysis technique in this study was carried out in a qualitative descriptive manner. The qualitative data were analyzed using thematic analysis by comparing data at one stage of the Countenance Stake model, i.e., antecedent in the description matrix with the standards in the consideration matrix. Afterward, conclusions are drawn based on the results of the data analysis. The stages of data analysis in this study included logical analysis and empirical analysis.

3. Results and Discussion

The evaluated components in the antecedent section involve the lesson plan designed by the teacher. In this section, an assessment is carried out on the application of metacognitive strategies in the planning of natural science learning in elementary schools made by teachers in the form of a lesson plan. The results showed that the metacognitive strategy-based lesson plan arrived at the "adequate" category (68.90%). This highlights that the lesson plan prepared by the teachers failed to describe the implementation of metacognitive strategy-based learning optimally.

Based on the results of the assessment of the lesson plan document, the teacher develops the lesson plan document in two different ways: 1) based on the standard process according to Regulation of Minister of Education and Culture No. 22 of 2016, which consists of 13 components, and 2) based on the Circular Letter of the Minister of Education and Culture of the Republic of Indonesia No. 14 of 2019 which only consists of three main components: objectives, measures, and learning assessments. The observation of the lesson plan made by the teachers signifies that only 40% of the schools have proper lesson plan components based on the standards of the learning process regulated in the Regulation of Minister of Education and Culture No. 22 of 2016 and Circular Letter of the Minister of Education and Culture of the Republic of Indonesia No. 14 of 2019.

The relevance between intense and field observations shows that some elementary school teachers have not mastered and implemented metacognitive strategies in the classroom. From the score of the lesson plan assessment, the preparation of the lesson plan (either consisting of 3 components or 15 components) is in accordance with the format, although there are some aspects that are not in accordance with the standard.

Several aspects of the lesson plan are in accordance with the standard and arrive at the "very good" and "good" categories. Those are: (1) school identity, (2) subject identity or theme/subtheme, (3) class/semester identity, (4) subject matter identity, (5) time allocation, (6) learning objectives, (7) learning methods/models/approach/strategy, and (8) learning media.

Meanwhile, there are several components of the developed lesson plan that do not have conformity with the predetermined standards; those include; (1) basic competencies and competency achievement indicators (GPA), (2) learning materials, (3) suitability of learning resources, (4) learning phases (introduction, core activities, and closing), and (5) assessment of learning outcomes. Each of the components only arrives at the "adequate" category.

The basic competency components (KD) and competency achievement indicators (GPA) are in the sufficient category (61.11%). This happens because 60% of teachers use the lesson plan format by referring to the standard Circular No. 14 of 2019 concerning the simplification of lesson plans. In the lesson plan format, KD and indicators are not listed. Some are only contained in the attached teaching materials. In the lesson plan developed, several indicators are not clearly stated, i.e.: (a) KD regarding aspects of knowledge and skills, (b) GPA is prepared as a description of KD, (c) GPA is compiled using operational verbs that can be observed and measured and (d) GPA is compiled based on HOTS.

The material learning components also do not have conformity to the process standards that have been set and are in the sufficient category (58.64%). Indicators in the category of learning materials include (1) components of learning materials (relevant facts, concepts, principles, and procedures), (2) learning materials set forth in the form of points in accordance with the formulation of GPA or learning objectives, (3) coverage of materials is in accordance with a set time allocation, (4) learning materials are compiled comprehensively, (5) meaningful teaching materials because in learning students can construct their own knowledge and relate it

to other concepts they understand, (6) teaching materials improve students' thinking skills, and mastery of concepts, (7) teaching materials train independent learning, (8) teaching materials emphasize the monitoring and self-responsibility of students, so that students can organize themselves to plan, monitor, and evaluate learning objectives, and (9) Student Worksheets (LKPD) which are designed according to indicators and learning materials.

The results of the assessment of the lesson plan document showed that some teachers did not attach teaching materials to the lesson plan. In addition, most teachers have not developed their own teaching materials and still rely on the use of student textbooks for teaching materials and students' worksheets. This causes the application of metacognitive strategies to be less visible in learning, either through teaching materials or worksheets made by the teacher. However, most teachers attach worksheets to lesson plans adopted from the thematic books.

The learning resource component in the lesson plan arrives at the "adequate" category (65.56%). The learning resources listed in the lesson plan are only the thematic package textbooks. There are very few teachers that include other learning resources such as website links from the internet. This leads to the lack of implementation of learning technology that goes in accordance with the principles of Technological Pedagogical Content Knowledge (TPACK).

Several discrepancies were also found in the components of the learning stage in the lesson plans, both in the preliminary, core, and closing activities. Such is emphasized by the results of the evaluation of the learning steps that arrive at the "adequate" category. In this component, the implementation of metacognitive strategies in learning is visible. The appendix shows several indicators of metacognitive strategies that have not been written in the lesson plans composed by the teacher, as indicated by several learning stages in the metacognitive strategy indicators that only arrive at the "adequate" or "lacking" category.

In the preliminary activity, there are several learning steps that are indicators of metacognitive strategies, i.e.: (1) the teacher helps students to set learning intentions, (2) the students are made aware that they must be responsible for planning and managing their own learning, (3) the teacher focuses the attention of students, (4) the teacher asks questions to determine the students' prior knowledge regarding the materials, (5) the teacher states the HOTS-oriented learning objectives, (6) the teacher conveys the benefits of the material for the day to motivate students' eagerness to participate in the learning process, (7) the teacher provides an outline of the material and an explanation of the description of activities according to the lesson plan, and (8) the teacher helps students set learning targets and make plans about learning assignments. These points arrive at the "adequate" category (65.83%).

The metacognitive learning strategy starts with students' self-awareness of the learning process they are doing. This is driven by the teacher's efforts to foster or help students to set learning intentions. Teachers must also be able to make students aware that they must be responsible for planning and managing their own learning. In addition, teachers must be able to focus the attention of students on their learning. From the results of the assessment, these three aspects arrive at the "lacking" category, as seen from the scores obtained, i.e., 46.67%, 41.11%, and 46.67%, respectively.

Furthermore, in the application of metacognitive strategies, teachers are not optimal in providing an outline of the subject matter and an explanation of the description of activities according to the lesson plan, which is indicated by a score of 55.46%. In the application of metacognitive strategies, the above aspects are important to do so that students are aware of the learning plans that they will make. Likewise, the point "teachers can help students set learning targets and make plans about learning tasks" that arrives in the "lacking" category (36.67%).

The core learning activities planned by the teacher arrive at the "adequate" category (67.63%). In the core activities in the lesson plan, there are also several metacognitive strategies that only arrive at the "lacking" category. These aspects include (1) the teacher explains the importance of materials and activities in the learning process (45.56%), (2) the teacher directs students to use the given learning strategies: underlining, taking notes, summarizing, writing, and making conceptual maps. (50.00%), (3) teachers allow students to determine and consider learning resources to be used (43.33%), (4) teachers help students in memorizing (47.78%), and (5) the teacher asks the students to formulate their own problems (45.56%), (6) the teacher motivates the students to be more enthusiastic in the next meeting (44.44%), and (7) the teacher asks the students to study the material will be discussed at the next meeting (47.78%).

The stages of core activities in the "adequate" category include (1) the teacher begins to explain the concepts in the problem that are already known to students and related to events in the daily environment (66.67%), (2) teacher explains important concepts (58.89%), (3) the teacher gives learning assignments, and problem-solving examples (56.67%), and (4) the teacher asks various questions that can encourage students to be able to formulate temporary answers or can formulate various approximate answers to a problem being studied (64.44%). Further, the rest of the stages for the core activities have been carried out by the teacher with "good" and "very good" indicators.

On average, the implementation of metacognitive strategies in the natural sciences lesson plan also arrives at the "adequate" category (63.00%) for the closing activities. The stages for closing learning activities that are in the "lacking" category include (1) students assessing their own understanding by filling out reflections in the form of checklists, rubrics, or learning journals related

to learning reflection (45.56%), (2) teacher provides reinforcement to the learning process. Conclusions made by students (53.33%), (3) the teacher motivates students to be more enthusiastic at the next meeting (44.44%), and (4) the teacher asks students to study the material that will be discussed at the next meeting (47.78%). Meanwhile, the closing activities that arrive at the "adequate" category comprise: (1) teacher encourages students to evaluate their own learning effectiveness (62.22%), (2) teacher provides HOTS-oriented evaluations (68.89%), and (3) teacher provides evaluations directed at developing problem-solving, critical, creative, and reflective thinking (65.56%).

In the component of the assessment of learning outcomes in the lesson plan, the formulation of the assessment plan also arrives at the "adequate" category (68.90%). There is one component that is still less than optimal in its planning, i.e., the answer key and the knowledge assessment rubric (44.44%). Other components that are not appropriate or are still in the "adequate" category consist of: (1) skills assessment instrument with clear rubrics or descriptions (64.44%), (2) HOTS-oriented assessment (57.78%), and (3) assessment directed to develop problem solving skills and think critically, creatively, and reflectively (61.11%).

The results of the achievement of the teacher's lesson plan document assessment have different scores if the assessment is based on process standards and on indicators of metacognitive strategies. In Figure 4.1, the average RPP assessment based on process standards has a score of 68.90%, while if assessed based on indicators of metacognitive strategy, it obtained a score of 63.79% in the "adequate" category. The results of this assessment have declined because some assessment items in the standard process are not included in the calculation.

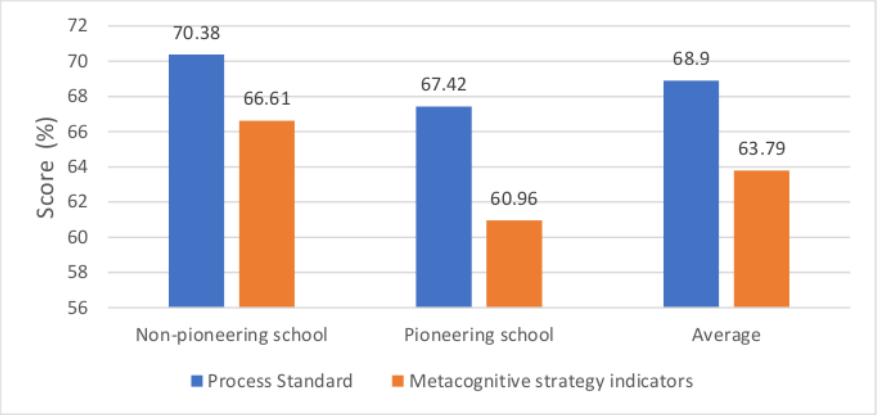

Figure 1. Achievement of Metacognitive-based Lesson Plan in Elementary Schools in Gorontalo City

The assessment of lesson plans in pioneering and non-pioneering schools shows different results. In non-pioneering schools, the assessment scores are higher by referring to process standards and indicators of metacognitive strategies than in pioneering schools. This is illustrated in Figure 1.

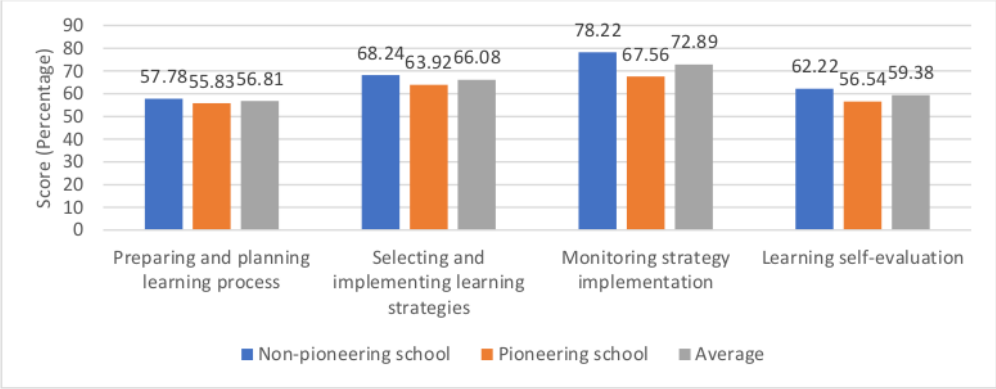

Figure 2. Achievement of Stages of Metacognitive Strategy Indicators in Lesson Plan

There are four stages of metacognitive strategies that are used as research indicators, i.e., (1) preparing and planning learning strategies, (2) selecting and using learning strategies, (3) monitoring the use of strategies, and (4) learning self-evaluation. In the first stage, the teacher starts learning by helping students to set learning intentions. Students are made aware that they must be responsible for planning and managing their own learning. The teacher focuses the attention of the students. The teacher asks questions to find out the students' prior knowledge regarding the material to be delivered. At this stage also, the teacher states the HOTS-oriented learning objectives and conveys the benefits of the material to be studied so that students are encouraged to participate in learning. At the beginning of the learning process, the teacher gives an outline of the material to be studied and an explanation of the description of activities according to the lesson plan. In addition, teachers can help students set learning targets and make plans about learning assignments.

In the first stage, as depicted in Figure 2, the teachers still have not mentioned the stages of the metacognitive strategy in the lesson plan. The average score for the first stage of metacognitive strategy in learning planning arrives in the "lacking" category (55.81%). This is also shown in both pioneering and non-pioneering schools, both of which have not stated the aspects of the first stage in the preliminary activities in the lesson plans composed by the teacher.

The second and third stages are included in the core learning activities. The second stage, selecting and using learning strategies, consists of seventeen activities carried out by the teacher, including; the teacher explaining the importance of materials and activities in the learning process; the teacher directing students to use the given learning strategies (underlining, taking notes, summarizing, writing, and making concept maps); the teacher asks students to formulate their own problems; the teacher asks various questions that can encourage students to be able to formulate temporary answers or can formulate various approximate answers to a problem being studied, and teachers facilitate students to think critically and creatively in problem solving.

The third stage includes five learning activities: (1) students work on assignments on the students' worksheet, (2) in class, the teacher periodically asks students about the material that has been studied and what is not understood, and the reasons, (3) the teacher asks students, students, to solve their own problems according to their respective experiences, (4) the teacher encourages students to produce critical and creative answers, and (5) students make conclusions about the discussion.

As shown in Figure 2, the teacher has an "adequate" performance in planning the stages of choosing and using learning strategies (66.08%). Meanwhile, in the third stage (monitoring the use of strategies), the teacher has a "good" performance in planning this stage in the lesson plan (72.89%).

Interviews conducted on the sample teachers related to their understanding of metacognitive strategies showed that they had studied metacognitive strategies before. After further exploration, teachers' understanding of metacognitive knowledge, skills, and strategies is still lacking. Most of the teachers admitted that they had never attended special training on metacognition in learning, and some admitted that the material on metacognition was simply inserted into other training programs. The same result occurs in the teacher's experience in attending training on HOTS-based learning. Some teachers claimed to have never attended the training and only focused on HOTS-based assessments. This minimal experience is the main factor in the lack of knowledge and skills in planning and implementing metacognitive strategy-based learning.

The results of the interviews showed that the teachers had a good understanding of the essence of natural science learning and how to plan interesting lessons, such as conducting experimental activities according to the needs of the subject matter and presenting teaching aids. For this reason, all of these teachers claimed to have provided worksheets for each meeting.

In terms of implementing learning, all teachers have prepared lesson plans and other important tools. There are two types of lesson plans found in schools: 1) lesson plans with 13 components referring to the Minister of Education and Culture Regulation Number 20 concerning Standards for the Learning Process; 2) Three-component lesson plan which refers to the Circular of the Minister of Education and Culture No. 14 of 2019. From the results of the assessment of the lesson plan document, the stages of learning made by the teacher are not detailed; some even do not use the syntax of a certain learning model. The same thing occurs in the three-component lesson plan, which only consists of learning objectives, learning steps, and evaluation. The lesson plans made by the teacher are less detailed, and many things are only implied. The components of basic competence, indicators of competency achievement, teaching materials, models/methods used, as well as media and learning resources are not included in the lesson plan.

In general, the characteristics of a good lesson plan are: (1) creating teaching and learning process activities that will become a learning experience for students, (2) arranging learning stages systematically so that learning objectives can be achieved, and (3) arranging learning stages in detail, so that if the lesson plan is used by another teacher (when the teacher is not present), it is easy to understand and does not cause double interpretation (Afandi & Badarudin, 2011).

Based on the results of the assessment of the three-component lesson plan, the teacher no longer writes down the detailed learning steps so that the application of metacognitive aspects cannot be observed clearly or may not even be implemented. The

results of the lesson plan assessment show that elementary school teachers have not been able to compose metacognitive-based learning plans that are in accordance with established standards.

The lesson plans prepared by the teachers describe their ability to apply metacognitive strategies to lesson planning. When the stages of applying metacognitive strategies cannot be implemented in the lesson plan, this illustrates the less than optimal performance of teachers in planning the implementation of metacognitive strategy-based natural science learning.

Metacognitive activities include thinking activities to plan, monitor, and reflect on how to solve a problem. Students should know what to do, how to do it, what conditions must be met in doing it, and know when to do it. In planning metacognitive strategy-based learning, a teacher should make students know the goals to be achieved. In the early learning activities, the teacher should help students to set learning intentions. Students should be made aware that they must be responsible for planning and managing their own learning. Teachers are also required to convey the benefits of the material to be studied to encourage student's interest in learning.

The next metacognitive strategy stage is choosing a strategy to achieve the goal. At this stage, the teacher should ask questions to find out the students' initial knowledge regarding the learning material. The teacher gives an outline of the material and an explanation of the description of activities according to the lesson plan. Teachers must be able to help students set learning targets and make plans about learning tasks. In implementing metacognitive strategies, students should be directed to use the given learning strategies, i.e., underlining, taking notes, summarizing, writing, and making concept maps. This stage can help students realize the learning process. Teachers should ask students to formulate their own problems. Not only that, teachers should encourage students to be able to formulate temporary answers or approximate answers to a problem being discussed.

4. Conclusion

This study aims to explore the antecedent planning of metacognitive strategy-based natural sciences learning in elementary schools in Gorontalo City. The study found that the metacognitive strategy-based lesson plan arrived at the "adequate" category (68.90%). This highlights that the lesson plan prepared by the teachers failed to describe the implementation of metacognitive strategy-based learning optimally. As the discussion is only focused on the elementary school level, further study on the different school levels should be conducted.

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