Advance Organizer Learning Model Based on Scientific Approach to Improve Students' Metacognitive Abilility: How Do We Assess its Quality?

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Abstract

One of the best ways for teachers to achieve learning objectives is to create learning models for their students. This study aimed to determine the quality of the Advance Organizer Learning model based on a scientific approach to improve students' metacognitive abilities. Three aspects are measured to assess the quality of the learning model, namely the validity, practicality, and effectiveness tests. This research is part of Research & Development with a 4D model (Define, Design, Develop, and Disseminate) which only focuses on the Development Phase. This research is for students and lecturers of the Elementary School Teacher Education Study Program of Makassar Islamic University, Indonesia. In addition, other participants involved in this study are experts to provide an assessment of the learning model that has been developed. Research instruments are validation sheets, observation sheets, tests, questionnaires, and documentation techniques were used to collect data. The data were analyzed quantitatively to determine the validity, practicality, and effectiveness of the product. The results showed that this learning model was declared valid, practical, and effective to be used for extensive trials.

Keywords: Advance Organizer Learning, Scientific Approach, Metacognitive Ability.

1. INTRODUCTION

Metacognition has become one of the issues in education that many experts have studied in recent decades. Metacognitive aspects are more associated with the field of education because these aspects are closely related to several things, including self-regulation, problem-solving, and academic achievement (Memnun & Akkaya, 2009). In addition, this metacognitive skill is considered necessary for students because it is regarded as an essential ability that must be mastered in the 21st century today (Muawiyah et al., 2009).

Metacognitive skills are also growing and increasingly associated with various fields of knowledge, such as mathematics, language (writing), and information technology (Garzón et al., 2020). These metacognitive skills are also identified with individual skills in superior cognitive aspects (Al-Shabibi & Alkharusi, 2018; Roeschl-Heils et al., 2003). Someone who has this skill turns out to impact increasing reflective thinking, being responsible, building self-confidence and developing critical and creative thinking (Kuiper, 2002).

From various kinds of literature, it is found that metacognitive skills have many benefits for students. Kipnis & Hotstein (2008) claim that metacognition is believed to improve their learning performance independently. Several other studies also provide the fact that these skills specifically impact improving learning outcomes in the cognitive, affective, and psychomotor domains (Srinivasan & Pushpam,

2016). In line with these findings, another study stated that metacognition was also able to improve students' conceptual understanding in the field of science, develop HOT skills, and improve students' attitudes towards science (Colthorpe et al., 2018; J. Flavell, 1979; Ghanizadeh, 2017; Jahangard et al., 2016). This metacognitive skill can also help students have a more significant opportunity to get the correct solution to the problems they face (Akben, 2018; Balta et al., 2016; Haeruddin et al., 2020).

Given the importance of these metacognitive aspects, teachers must be able to design appropriate learning models to develop these abilities. One approach that can be used is an advance organizer. This approach refers to Ausubel's (1968) theory, defined as a device that represents and connects one's field of knowledge to create a better understanding. The advance organizer is also an inclusive concept statement in introducing the following material (Apochi et al., 2018; Woolfolk, 2001). This approach can assist students in increasing interest and serves as a conceptual bridge that connects old information and new information (Daniel, 2005; Zaman et al., 2015).

Many studies have related to metacognitive abilities associated with the Advance Organizer learning model and scientific discovery. Masni (2015) states that the Advance Organizer and Scientific Discovery metacognitive learning approach can improve students' mathematical problem-solving abilities. In addition, this study also proves that this approach can also enhance students' mathematical thinking habits at the junior high school level. Another study describes that the Facebook-assisted Advance Organizer learning model positively impacts students' cognitive learning outcomes on global warming material (Nadira & Ramdhan, 2018). In addition, Namira et al. (2014) found that metacognitive strategies assisted by advance organizers positively impacted student learning outcomes. Hutajulu, (2017) also stated the same thing, which said that students' critical thinking skills were much better by using the metacognitive skills approach with the advance organizer model compared to other learning models.

From these several studies, no research has focused on the teacher's efforts to design an advanced organizer learning model by combining a scientific approach in it. Teachers are required to be able to design their learning models and devices because only they understand the actual situation in which they teach (Helaluddin et al., 2021; Supartini et al., 2020). Designing a learning model involving teachers and students as part of the process is assessed as to their participatory form in learning. For this reason, researchers are interested in designing the learning model and testing its quality level. The question in this study is how the level of validity, practicality, and effectiveness of the advance organizer learning mode with a scientific approach in improving students' metacognitive abilities.

2. Literature Review

Metacognitive Ability

Metacognitive is a term introduced by Flavel (1976). It states that metacognition is the ability to think about how to learn. By thinking about how to learn, information can be obtained about how successful the learning is and how to improve it for the following learning process. In addition, metacognition is also defined as awareness and control of cognitive processes for students (Eggen dan Kauchak dikutip Hendrawati, 2018). In addition, Ramdiah (2015) said that metacognition is an activity of thinking about the thinking process.

Experts also put forward the definition that is not much different. Sumampouw (2011) states that metacognition is the process of knowing and monitoring thinking activities or what they do themselves. In addition, Peters (2000) adds that metacognition refers to the ability of learners to control and monitor the learning process they do consciously. Slavin (2019) also strengthens Peters' statement by claiming that metacognition is knowledge about his learning, how he learns, and how he monitors how he knows. Furthermore, there are several aspects contained in metacognition that experts have put forward. Boekaerts et al. (2000) state that there are three aspects of metacognition,

namely: (1) the awareness that a person has about their academic strengths and weaknesses, (2) knowledge of the cognitive powers used in carrying out tasks, and (3) setting actions to optimize learning outcomes.

Advance Organizer Learning Model with Scientific Approach

The advance organizer learning model with the scientific approach is a learning model that prioritizes students' cognitive structure. Ausubel is given the meaning of one's knowledge of a particular field of science at a specific time and the extent of its organization, clarity, and steadiness. The advance organizer model is a supporting framework for new information, not just a meaning of lesson recognition. Still, it is a hook, anchor, scaffolding (supporting frame-work) intellectual, for subsequent learning materials, helping learners see the 'big picture of the various things presented.

According to Huda (2013), the advance organizer model is designed to strengthen students' cognitive structure and knowledge of specific lessons and how to manage correctly, clarify, pay attention to and maintain such knowledge. Joyce et al. (2011) said that advanced organizer learning is designed to strengthen the cognitive structure of learners and their understanding of specific lessons and how to manage, clarify, pay attention and nurture knowledge. It is further explained that, in other words, the cognitive structure must correspond to what type of knowledge we have in mind, how much that knowledge is and how this knowledge is managed. It is concluded that the advance organizer learning model with a scientific approach is constructivist learning based on the principle of orienting students to the material before reading or class presentation, which is used to improve, manage, clarify, pay attention, and maintain knowledge.

Validity, Practicality, and Effectiveness

Before being used, the learning model that this researcher has developed must be tested through a series of tests to determine whether the product is suitable for use. There are three types of tests carried out in this process: tests of validity, practicality, and effectiveness (Nieveen, 1999). The validity test is carried out by asking experts, according to their expertise, to assess the quality of the product in terms of various aspects (Helaluddin et al., 2021; Supartini et al., 2020). The factors evaluated by the expert in the validity test include (1) content, (2) product organization, (3) language used, (4) and others.

The second test is the practicality test of the product that the researcher has developed. This test is aimed at prospective users of the product, namely lecturers and students. Learning products can be practical if they can be applied in the field (Nieveen, 1999; Zulkifli, 2013). Finally, another aspect measured to determine product quality is effectiveness testing. This effectiveness test aims to obtain information about student learning outcomes that have been targeted. In other words, learning products are said to be effective if there is a link between learning outcomes and the curriculum and can provide feedback (Kadir et al., 2018; Nieveen, 1999).

3. Research Method

Research Design, Site, & Participants

This research is part of a research and development carried out by applying the 4D Model by Thiagarajan et al. (1974). Based on this model, there are four phases that researchers must go through in designing and developing a product, namely Define, Design, Develop, and Disseminate. This article only focuses on the "development" phase by conducting several tests to determine the quality of the learning products that have been developed. The intended tests are validity, practicality, and effectiveness (Nieveen, 1999).

This research was conducted at the Faculty of Teacher Training and Education, Makassar Islamic University, Indonesia, involving three lecturers and 30 students (1 study group). In addition, there are two experts involved in this study to assess the quality of the learning product. Experts are selected based on

educational background and teaching experience of at least 15 years and have a minimum doctoral degree.

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Data Collection

1.   Product Validation Sheet

To test the level of product validity, the researcher designed a product validation sheet with various aspects included in the instrument. This instrument consists of several types, namely model book validation sheets, lecturer handbook validation, student handbook validation, and Semester Learning Plans. Experts were asked to assess the product developed by choosing a score range between 4 (highest score) to 1 (lowest score).

2.   Lecturer and Student Response Questionnaire

In addition to the two instruments above, research data was also collected using a questionnaire, namely a lecturer and student response questionnaire. The lecturer's response questionnaire aims to manage their responses and assessments when using the learning product. The student response questionnaire aims to obtain comprehensive information about their feelings whether the learning product helps them in learning.

3.   Learning Outcome Test

To determine the effectiveness of the learning model, the researcher used a learning outcome test aimed at students. The test used is an essay test with ten questions about the Elementary

School Social Science Education Course materials.

Data Analysis

After the data was collected, the researcher then analyzed the data quantitatively. The data from the various instruments are grouped into three main sections, validity test data, practicality test data, and effectiveness test data. The validity data from the experts were analyzed and then matched with the validity criteria, as shown in table 1 below.

Table 1. *Criteria for validity by Ratumanan & Laurens (2011)*

Score interval	Category
$3.6 \leq p \leq 4.0$	Very Valid
$2.6 \leq p \leq 3.5$	Valid
$1.6 \leq p \leq 2.5$	Less valid
$1.0 \leq p \leq 1.5$	Invalid

In addition to analyzing the level of validity of learning products, data from student and lecturer responses are used to determine the level of practicality of the model. After the results of the practicality analysis are known, they are matched with table 2 practicality as follows.

Table 2. *Product practicality criteria (Hala et al., 2015)*

No	Score Interval	Category
1.	$3.6 < X \leq 4.0$	Very Practical
2.	$2.6 < X \leq 3.5$	Practical
3.	$1.6 \leq X \leq 2.5$	Less Practical
4.	$1.0 \leq X \leq 1.5$	Not practical

Finally, to determine product effectiveness, the researchers collected data from student learning outcomes. The pretest and posttest were analyzed to determine the N-gain score. After that, the scores obtained from the learning outcomes are compared with table 3 below.

Tabel 3. *Skor N-gain (Hake, 1999).*

Skor N-gain	Normalized Gain Criteria	Category
0.70 < N-gain	High	Very effective
0.30 ≤ N-gain ≤ 0.70	Moderate	Effective

N-gain < 0	Low	Ineffective

can be concluded that based on the responses of the lecturers, this learning model is declared practical with an average score of 3.8.

4. Result

Results of Validity Test

Products developed through research & development procedures are tested for quality to determine their level of validity. The product validity score is obtained from the average value of the two experts who have given their assessment. There are four learning products developed and assessed by experts: learning model books, lecturer handbooks, student books, and Semester Learning Plans. The results of the product validation test can be seen in Table 4 below.

Table 4. *Product validity test results*

Learning Products	Mean	Category
Model Book	3.82	Very valid
Lecturer's Handbook	3.84	Very valid
Student Book	3.80	Very valid
RPS	3.82	Very valid
Total	**3.82**	**Very valid**

From table 4 above, information is obtained that the learning model that the researcher has developed is declared valid based on the experts' assessment. Overall, the average score of learning products is 3.82 with the following details: (a) model books with an average score of 3.82, (b) lecturer handbooks of 3.84, (c) student books of 3.8, and (d) Semester Learning Plan of 3.82. The advance organizer learning model based on this scientific approach is declared very valid because it has an average score of assessment that is in the range of 3.6 to 4.00 in the criteria table in the previous method section.

Results of Practicality Test

The data from the responses of lecturers and students about the learning model are analyzed, and the results are presented in Table 5 below. From the four aspects that were responded to by the lecturers, an average score of 3.8 was obtained for the learning device aspect, 3.7 for the presentation feasibility aspect, 3.5 for the language feasibility, and 3.8 for the assessment aspect in improving learning outcomes. So, it

Table 5. *Results of lecturer response analysis*

Assessment Indicator	Score	Information
Learning devices	3.8	Practical
Presentation eligibility	3.7	practical
Language eligibility	3.5	Quite practical
Assessment in improving learning outcomes	3.8	Practical
Average	**3.8**	**Practical**
Percentage	**92.5%**	**Practical**

Next, to determine the level of practicality of the learning model, it also uses responses from students as users. In general, the results of the student responses are presented in the following table. Overall, the average score of student responses is 3.66, which indicates that this development product is categorized as very practical because it is in the range of 3.5 to 4.0 in the table of practicality criteria used in the research methods section (data analysis techniques).

Table 6. *Student response results*

Assessment Indicator	Mean	Information
Learning Device Components	3,5	Quite Practical
Novelty	3.8	Practical
Understanding the Contents of Model Books and Teaching Materials	3,6	Practical
The implementation of learning	3,5	Practical
Lecturer's response to students	3,7	Practical
Average	**3.66**	**Practical**
Percentage	**92%**	**Practical**

Results of Effectiveness Test

To test the effectiveness of the learning model, the researchers carried out a test of learning outcomes for one class using a pretest and posttest. From the two test results, the N-gain scores obtained by each student were then analyzed. In general, the effectiveness test results are presented in Table 7 below.

Table 7. *Results of Student Metacognitive Ability*

No	Metacognitive		N-gain
	Pre	**Post**	
1	57.5	82.5	0.59
2	57.5	87.5	0.71
3	77.5	92.5	0.67
4	77.5	90	0.56
5	80	92.5	0.63
6	80	95	0.75
7	67.5	92.5	0.77
8	65	97.5	0.93
9	67.5	82.5	0.46
10	62.5	92.5	0.80
11	60	85	0.63
12	70	95	0.83
13	85	97.5	0.83
14	82.5	87.5	0.29
15	85	97.5	0,83
16	65	92.5	0.79
17	80	95	0.75
18	80	90	0.50
19	75	95	0.80
20	67.5	90	0.69
21	62.5	85	0.60
22	65	90	0.71
23	72.5	87.5	0.55
24	60	87.5	0.69
25	67.5	90	0.69
26	65	87.5	0.64
27	80	92.5	0.63
28	80	97.5	0.88
29	57.5	90	0.76
30	60	95	0.88
	2112.5	2732.5	20.81
	70.416	**91.083**	**0.6937**

Based on table 7, it can be seen that the score of students' metacognitive abilities before the application of this learning model was 70.41 (low category). Furthermore, the student's metacognitive ability score rose to 91.08 in the posttest session. There is an average gain index score obtained of 0.69 after students learn by using the Advance Organizer learning model with this scientific approach. This shows that the results of students' metacognitive abilities have increased by using the learning model that the researcher has developed.

5. Discussion

Products developed through research & development procedures are tested for quality to determine their level of validity. The product validity score is obtained from the average value of the two experts who have given their assessment. There are four learning products developed and assessed by experts: learning model books, lecturer handbooks, student books, and Semester Learning Plans. The results of the product validation test can be seen in Table 4 below.

The ability of lecturers or teachers to create and design the learning models that they use is an ability that is the hallmark of professional teachers. For this reason, designing learning models and tools is very important so that learning objectives can be achieved. One of the phases in designing learning models is the development phase, one of which contains testing the quality of the products that have been developed. This trial is concerned with testing its validity, practicality, and effectiveness by involving experts and potential users of the product (Helaluddin et al., 2020; Nieveen, 1999).

Based on the validity, practicality, and effectiveness tests, it can be concluded that the scientific approach-based advance organizer learning model is proven to be valid, practical, and effective. Validity is determined by the assessment of experts on several elements and elements that exist in the learning model. Learning products that have been developed can be valid if they have elements at a predetermined standard (Hasmawaty et al., 2020). This validity test was conducted to determine the theory's compatibility and other aspects, such as learning activities, learning steps, and teaching methods (Gravemeijer & Cobb, 2006).

In addition to the validity test, the quality of the learning model is also determined by the practicality test. This test is usually aimed at prospective users of the product, namely lecturers and students. The results of this study indicate that the model and learning tools are practically based on the responses of lecturers

and students after they use the product. Learning products can be declared practical if users can enjoy and feel the ease when learning by using these products (Yazid, 2011). In line with this statement, the product's practicality can also be assessed from the user's activity in applying it during the learning process without experiencing significant obstacles (Mustami et al., 2019; Syahputra et al., 2015).

Product effectiveness testing was also carried out in this study to know the level of quality of the learning product. In general, product effectiveness can be seen from student learning outcomes achieved during the learning process. The product is said to be effective if most of the students in the study group reach learning achievements as expected (Helaluddin et al., 2020). The effectiveness of the product can be seen from the accomplishments of students who meet the criteria of "good" or "very good" (Jean et al., 2017). Punia & Kant (2013) assessed that several factors could affect the level of effectiveness of product development, namely: (a) motivation, (b) attitude, (c) training style, (d) instructor openness, (e) environment, and (f) basic skills.

The development of this learning model aims to improve students' metacognitive abilities, which are seen as an essential aspect. This is because metacognition is critical in encouraging students' higher-order thinking skills (HOTs) (Hastuti et al., 2020; Kuzle, 2013; Wismath et al., 2014). It is said so because this metacognitive ability has the same scope as HOTs, namely understanding, analyzing, and controlling cognitive processes (Door & Perels, 2019; Flavell et al., 2002). The development of this metacognitive ability is flexible because it changes and develops continuously depending on the treatment given to students. In fact, with this metacognitive ability, students are directed to be able to learn independently by achieving better learning outcomes (Tarrant & Holt, 2016; Van-Der-Stel & Veenman, 2014; Winne & Hadwin, 2008).

6. Conclusion

One of the abilities of lecturers that must be mastered is developing and designing their learning models that are tailored to their needs analysis. In developing learning products, three tests must be passed to know the extent of the quality of the products produced. The three product quality tests developed are validity, practicality, and effectiveness. Based on the research results, the advance organizer learning model is valid, practical, and effective in improving students' metacognitive abilities. Metacognitive aspects are considered essential to be given a more significant portion because these skills are needed in the 21st century. These skills are considered equivalent to higher-order thinking skills (HOTs) because they cover aspects of understanding, analyzing, and controlling cognitive processes.

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