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The Effectiveness of Using Revised Bloom's Taxonomy-Oriented Learning Activities to Improve Students' Metacognitive Abilities

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Abstract

Learning activities carried out in schools today lack innovative and varied approaches. There are few learning activities that can help develop students' meta cognitive abilities. Meta cognitive abilities are important for students to realize their weaknesses and strengths in studying and utilizing learning materials. This study analyses the effectiveness of developing revised Bloom's taxonomy-oriented learning activities to improve students' meta cognitive abilities. A quasi-experiment was used as the research design, in the form of a posttest which allowed control over the design. The subjects of this survey were all fourth graders, consisting of 132 students. The random sampling method was used to select 44 students. The data collection method used was via a test. The testing instrument used was a 10-item descriptive test. The methods and techniques of data analysis used were inferential statistical analyses. The data analysis used an independent sample t-test using SPSS. The independent sample t-test result showed 0.00 < 0.05. This meant that the development of learning activities based on Bloom's revised classification method was effective for improving students' meta cognitive skills.

Keywords: Learning activities, Bloom's taxonomy, Metacognitive.

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Contribution of this paper to literature

The results of this research strengthen the theory of the guided inquiry learning model which had a positive effect on the creativity of children in kindergartens. Moreover, the guided inquiry learning model interacted positively with the social interaction ability of the children. Children with high social interaction benefitted greatly when they were taught using the guided inquiry learning model in improving their creativity, while the children who had low social interaction benefitted more when they were taught using the conventional learning model. So, the identification of children's social interaction ability was needed before the appropriate learning model could be applied.

1. Introduction

The school determines a student's learning outcome , pattern, structure and curriculum content. Most of the teaching and learning process and student learning outcomes are influenced by teacher competence. Competent teachers are able to create an effective and enjoyable learning environment and manage classes to optimize student learning outcomes (Andini & Supardi, 2018; Lubis, 2013). Active learning refers to a process of activities carried out by students in learning. They can be physical, mental or both (Baharun, 2015; Syaparuddin, Meldianus & Elihami, 2020). Learning is not just memorizing facts or information; learning involves doing and gaining experiences to reach the expected goals. Therefore, learning strategies must encourage student activity (Ahmadiyanto, 2016; Nurdyansyah & Fitriyani, 2018) and innovative actions by teachers are needed in developing learning activities that build student participation. Activities have an important role in learning, as learning changes student behavior to encourage active participation in the lessons (Ahmadiyanto, 2016; Pane & Darwis, 2017). Teachers should concentrate on building students' metacognitive abilities when carrying out learning activities. Metacognitive ability is one of the important factors in the cognitive process. However, metacognition is sometimes ignored even though it is necessary to achieve educational goals. It is not easy to obtain this skill since it requires a full understanding of metacognitive knowledge and how every student can possess it (Iskandar, 2014). So teachers need to train students to cultivate and improve their metacognitive abilities. Teachers need to pay attention to students' metacognitive abilities by focusing on how to know and think about what students know while students are engaged in meaningful learning (Lestari, Selvia, & Layliyyah, 2019; Putri & Dirgantoro, 2018).

Learning activities today are still not sufficiently varied, and they are carried out while ignoring students' metacognitive abilities. Student activities in learning are just limited to listening to teacher explanations, doing assignments and carrying out discussions, so there are no further activities that students do to support learning. Students tend to be passive in every teaching and learning process and show less passion, interest and enthusiasm for learning (Kristin & Rahayu, 2016; Nyoman, 2018). Learning in a teacher-centered classroom compels students to accept what the teacher says without being actively involved in the learning process. The material is memorized through rote learning and students are passive learners, so learning becomes uninteresting and boring (Kirom, 2017; Sarnoko, Ruminiati, & Setyosari, 2016). Teachers always use the easiest method which is lecturing, where the students listen and record what the teacher says and finally memorize the material (Handika & Wangid, 2013). The result of conventional learning is that students become passive learners. They only listen to the teacher's explanations and note down points that are considered important but they do not really understand the material presented. Most teachers use the lecture method with no attention paid to how students understand the presented information. Teachers only try to complete teaching by covering the syllabus before the Final School Examinations. Problems in learning arise as students rarely respond to teachers' questions during the lesson and there is a lack of attention when the teacher explains the learning components and activities. Student activities are limited to seeing, hearing and recording, which cause many students to play, sleep or sit quietly in class during the teaching process (Syahrir & Susilawati, 2015). In addition, the results of the 4th grade SD Cluster of VII Sukasada district in 2020/2021 confirm that online learning activities conducted through WhatsApp are limited to setting assignments. There is no opportunity to develop students' metacognitive abilities among fourth-grade elementary school students at Gugus VII Kecamatan Sukasada in the 2020/2021 school year.

These problems should spur teachers to provide opportunities to improve students' metacognitive abilities. It can be done by developing learning activities based on Bloom's revised taxonomy; such activities can positively influence students' meta cognitive abilities and enable them to participate actively in learning. Positive results and goals can be achieved through effective learning of an interesting lesson based on Bloom's taxonomy. Taxonomy becomes the guideline to help teachers classify the statements used to predict the ability of students to learn as a result of the learning activities carried out in class (Adesoji, 2018; Darmawan & Sujoko, 2013; Magdalena, Islami, Rasid, & Diasty, 2020). The Revised Bloom's taxonomy in learning can greatly aid in increasing students' knowledge, especially metacognitive knowledge. There are six dimensions of cognitive processes in Bloom's taxonomy: remembering, understanding, applying, analyzing, evaluating and creating. There are four in the knowledge dimension: factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge. The revised Bloom's taxonomy-oriented learning activities which focus on improving students' metacognitive abilities were designed to be innovative and varied. . This study is supported by previous studies. The study results show significant differences in cognitive processes between groups of students who studied with media-based learning activities and students who studied using conventional learning, in the fourth grade 2013 elementary school curriculum in Kecamatan Sukasada. Applying learning activities associated with serial picture media in a scientific approach is deemed necessary in learning. This requires students to carry out group activities to solve a given problem. This learning process helps to improve the cognitive processes of students (Agung, Widiana, & Indrasuari, 2017). Similar research states differences in metacognitive abilities between students who were taught using a contextual approach based on cognitive style and direct learning. Students who learned through a contextual approach based on cognitive style had higher metacognitive abilities compared with students who experienced direct learning (Zakiah, 2017). Students' learning activities, driven by their willingness to learn, are a sign that they are already confident that they will study seriously. One thing that can be seen here is that learners who have high learning motivation and participation experience positive outcomes (Nurmala, Tripalupi, & Suharsono, 2014).

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In the development of learning activities based on Revised Bloom's taxonomy, the outcomes of learning include: 1) self-awareness of the surrounding economic activities, 2) self-awareness of magnetic forces, 3) self-awareness of magnetic forces and gravitational forces, 4) self-awareness of collage, mosaic, montage artworks and application, 5) self-awareness of tolerance towards diversity and 6) self-awareness of making collage and mosaic art. Through these learning outcomes, students are accustomed to reflecting on their awareness of what is known and unknown so that they are consciously honest about their knowledge and correct their mistakes. Experts first tested Bloom's taxonomy-oriented learning activities to determine the validity of the learning activities to be applied to students. Four experts carried out the task of testing the content of learning activities by obtaining outcomes of validation in the content of the learning activities, which obtained the highest score of 4.75 and the lowest score of 4.25. Bloom's revised classification-oriented learning activities obtained an average score of 4.47 for content validation of learning activities. The convertion to a five-scale conversion guideline indicated the total average score for the validation of learning activities content to be in the range of 4.0 < X 5.0 with a big predicate. According to the predicate, the activities developed were suitable for learning. This is because learning activities are developed based on the characteristics of students and refer to indicators of an active learning theory, which makes students the center of learning. Through such learning activities, students become more active by developing and building knowledge. So this revised Bloom's taxonomy-oriented learning activity needs to be applied to learners to investigate whether this learning activity produces positive results in students' metacognitive abilities.

2. Methods

This research used a quasi-experimental design in the form of a posttest-only control design. The experimental group was treated with Revised Bloom's classification-oriented learning activities in carrying out the research. The control group was not given any treatment and participated in learning without the revised Bloom's taxonomy-oriented learning activities. Both experimental and control groups were given a post-test to determine the difference in meta cognitive ability between the experimental group taught using Bloom's taxonomy-oriented learning activities and the control group which was not exposed to the revised Bloom's taxonomy-oriented learning activity. This research design is shown in Table 1 below:

Table 1. Research design.

Class	Treatment	Posttest
Experimental Group	X	O1
Control Group	-	O1

Note:
X: Experimental group taught using Revised Bloom's Taxonomy-oriented learning activity.
- : No treatment given.
O1 : Posttest Control Group and Experimental Group.

The study population comprised 132 fourth-grade students in Cluster VII Sukasada District which consisted of 6 schools. The equivalence test on the population showed that all students were equal in ability. Next, random sampling was done to identify the experimental and control groups. The experimental group, SDN 1 Selat consisted of 25 students while the control group SDN 4 Selat consisted of 19 students. The experimental group followed the lesson by applying the revised Bloom's taxonomy-oriented learning activity. The control class followed the lesson without applying the revised Bloom's taxonomy-oriented learning activity.

Data were collected through the test method. This test method aimed to determine the effectiveness of using Bloom's revised classification-oriented learning activities to improve students' meta cognitive skills. The meta cognitive skills test instrument, used in the form of a descriptive test, consisted of 12 essay questions on the theme of beauty in the country's diversity. The test used one sub-theme, namely sub-theme 3, but only ten items of the test were administered to students. The items were adjusted to suit the cognitive levels of fourth-grade elementary school children. The test consisted of twelve questions: C1, two questions; C2, two questions; C3, two questions; C4, two questions; two questions for C5 and two questions for C6. Before the meta cognitive ability test instrument was used, it was tested for validation, reliability and difficulty levels. Content validity was done by using CVR. Based on the outcomes of the CVR test, it was found that all items of the meta cognitive ability test instrument were valid and suitable to be used. The result of the ∑CVR of the meta cognitive ability test instrument was 11.5. The analysis proceeded with the CVI calculation. The CVI of the meta cognitive ability test instrument was 0.9 showing a high level of acceptance.

Table 2. Meta cognitive ability test instrument.

No	Basic Competencies	Number of Questions	Description
1	3.2 Identify the economic, social, ethnic, cultural and religious diversity of local states in relation to the Indonesian national identity and its spatial characteristics	2	Valid
2	3.3 Identify different types of forces such as electrical force, muscle force, gravity , magnetic force and frictional force	2	Valid
3	4.3 Show the benefits of strength in everyday life, for example, muscle strength, magnetic force, electrical force, frictional force and gravity	2	Valid
4	1.4 Appreciate the many forms of Indonesian ethnic, social and cultural diversity, united through integrity, as a gift from Almighty God	2	Valid
5	3.4 Knowing the art of pasting techniques	2	Valid
6	4.4 Create collages, montages, apps and mosaic	2	Valid

The Alpha Coefficient formula was used to test the reliability of the meta cognitive ability test. Data collected was in the form of polytomies. Calculation of reliability showed 0.75 or high-reliability. The results indicated that

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the levels of difficulty of the meta cognitive ability test items of 10 questions, eight questions were in the range of medium difficulty category and two questions were in the easy category. The difficulty level of the description test kit was 0.69, so the test kit used was catagorized as fulfilling the criterion moderately. The following is a summary of the items in the meta cognitive ability test instrument, presented in Table 2.

In data analysis, inferential statistical analysis was used to determine the effectiveness of using Revised Bloom`s taxonomy-orientated learning in sports activities to gauge students' meta cognitive abilities. Inferential statistical analysis was used with independent sample t-test using SPSS 25.0 Windows; the prerequisites, namely normality test and homogeneity test were first conducted. Then an independent sample test analysis was done using SPSS 25.0 Windows to determine the effectiveness of using revised Bloom's taxonomy-oriented learning activities on students' meta cognitive abilities.

3. Results and Discussion

3.1. Results

This study analyzed the effectiveness of using revised Bloom's taxonomy-oriented learning activities on students' metacognitive abilities. It was tested with students from SDN 1 Selat who were selected as the experimental group. After the learning activities had been carried out, tests were given to the experimental and control groups in the form of a list describing 10 items. The results of the control group and experimental group were then analyzed to get the average scores, standard deviation, variance, the highest score and the lowest score obtained by the students. Results of the post-test descriptive analysis are given in Table 3.

Table 3. Results of post-test descriptive analysis.

Statistics	N	Range	Min	Max	Mean	Std. Deviation	Variance
Experiment	25	16	30	46	39.12	4.50	20.277
Control	19	15	17	32	25.42	3.93	15.480

The findings of data analysis as shown in Table 3, of students' metacognitive abilities show quite big differences. The control group has an average score of 25.42, which, when converted into a five-scale conversion guide, is in the low level, while the experimental group has an average score of 39.12 which is in the high level when converted into a five-scale conversion guide. So, it can be concluded that the revised Bloom`s taxonomy-orientated studying activities improve students' metacognitive capabilities in comparison to studying without these activities. An independent sample t-test was carried out using SPSS 25.0 Windows to strengthen the results of the descriptive analysis, through the homogeneity and normality tests. The outcomes of the normality test are shown in Table 4.

Table 4. Normality test results.

Variable	Group	Kolmogorov-Smirnov		
		Statistic	Df	Sig.
Metacognitive Ability	Experiment	0.129	25	0.200
	Control	0.126	19	0.200

Normality test was performed using Kolmogorov-Smirnov. The normality test results showed the data in the control group and experimental group to be normal. The scores of the experimental group and control group were both 0.200, which is more than the significance level at 0.05. The homogeneity test was conducted and the results are shown in Table 5.

Table 5. Results of homogeneity test.

Variable	Statistics	Levene Statistic	df1	df2	Sig.
Metacognitive Ability	Based on Mean	0.223	1	42	0.639
	Based on Median	0.233	1	42	0.632
	Based on Median and with adjusted df	0.233	1	41.326	0.632
	Based on trimmed mean	0.247	1	42	0.622

The homogeneity test was next carried out using SPSS. The data would be considered homogeneous if the significance score (sig.) in the Test of Homogeneity of Variances table > the significance level (t.s) of 0.05. The homogeneity test results showed the Mean at 0.639. The data was considered homogeneous, as indicated by the score of Sig. being more than 0.05. Therefore, the data of both the control group and experimental group were homogeneous. The requirements for normality and homogeneity were met. The research data obtained were normally distributed and homogeneous, so hypothesis testing using SPSS 25.0 Windows could be carried out using the Independent sample t-test. The results of the complete analysis are presented in Table 6.

Table 6. Independent sampel t test.

Statistics		t-test for equality of means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Metacognitive Ability	Equal variances assumed	10.544	42	0.000	13.699	1.299	11.077	16.321
	Equal variances not assumed	10.744	41.116	0.000	13.699	1.275	11.124	16.274

The results of the independent sample t-test show the score for Equality of Means of tcount = 10.544 > ttable 2.01808. In contrast, the score obtained was 0.00, less than the significance level of 0.00 < 0.05, so H0 is rejected

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and H1 is accepted. This shows that using the Revised Bloom's Taxonomy learning activities to improve students' metacognitive skills was effective.

3.2. Discussion

The results of this research show there were differences in students' metacognitive abilities between the group which was taught using Revised Bloom's taxonomy-oriented learning activities and the group taught without using these activities. The study concludes that the use of Revised Bloom's taxonomy-oriented learning activities can improve students' metacognitive abilities. The abilities acquired include: 1) awareness of surrounding economic activities, 2) awareness of magnetic forces, 3) awareness of magnetic forces and gravitational forces, 4) awareness of collage, mosaic, montage artworks and application, 5) awareness of tolerance towards diversity and 6) making collage and mosaic art. Bloom's revised classification-oriented learning activities are designed according to the characteristics of students in elementary schools and by utilizing active learning indicators (active learning theory), which makes students the center of learning so that students can actively participate in the learning process. Active learning theory has 14 indicators, but seven are used as a reference for learning activities oriented to Bloom's revised taxonomy; these include 1) student-centered learning, 2) suitability of learning activities, 3) making discoveries in learning, 4) learning activities which enable student independence. 5) arious uses of learning media, 6) physical and all-sensory involvement in learning, 7) learning processes which involve social interaction (Fahmi, 2013). Such learning activities help to activate students who were previously taught using the lecture and assignment methods. Through this learning activity, students can participate actively in learning and receive opportunities to develop their metacognitive abilities that help increase their motivation or willingness to learn. Students are more independent in learning and can work together in groups to try their best to complete assignments by discussing closely with their friends; such learning invites students to be active. Active learning needs to optimize the use of all the students' potential in order to achieve satisfactory learning outcomes according to the student's characteristics. In addition, active learning should help draw students' attention to the learning process (Asiah, 2017). For this reason, in the learning process, learners accept the knowledge provided by the teacher and are required to participate in the learning process. In learning activities, teachers should apply learning according to the characteristics of students in elementary school and emphasize student activities, in both evaluating and analyzing what they learn (Haryanti, 2017; Septianti & Afiani, 2020). Students play an important role in teaching and learning activities as students can be actively involved in a good learning process (Ariani, 2017). Students' engagement with learning activities, driven by their willingness to learn, are a sign that they are already confident that they will study seriously. One of the obvious conclusions that can be made is that children with high learning motivation and involvement in learning activities will be successful (Nurmala et al., 2014). In the learning activities that are carried out, students are more motivated when learning uses concrete objects that make students much more interested to actively participate in the learning process and understand what they are learning. Theoretically, elementary school students are in a concrete working stage, and when they are given concrete support, they think rationally and objectively with their hearts and minds (Juwantara, 2019).

Based on the results of the analysis, Bloom's revised classification-oriented learning activities are shown to have a significant effect on improving the metacognitive skills of fourth grade elementary school students. The difference in metacognitive abilities acquired by students who are taught using revised Bloom's taxonomy-oriented learning activities and those who are not exposed to the same activities is due to the avilability of opportunities for learners to be active and build their metacognitive abilities in the learning process. Through these learning activities, students are accustomed to reflecting on their awareness of what is known and unknown so that they are consciously honest about their knowledge and are able to correct the mistakes they maee. Students also actively ask questions about things or material they do not understand. Students become more confident in their knowledge because they dare to be honest about their knowledge. Through metacognition, students are aware of the importance of questioning themselves. Students are invited to realize their weaknesses and strengths in studying learning materials and how to overcome them (Lestari et al., 2019; Putri & Dirgantoro, 2018). Awareness of students in solving problems is very important because, through this awareness, students can determine whether the completion process is correct and to what extent there is truth in it. Students can evaluate solutions to errors, both conceptual and procedural (Schoenfeld, 2016). If students have metacognitive abilities, they can have a strong and thorough understanding of problems and their solutions, by using logical arguments that give them confidence in learning and solving problems (Barbacena & Norina, 2015). Students' metacognitive abilities are very helpful in ensuring learning success, through the awareness of their ability to develop various possible ways to solve problems (Safitri, 2017). Metacognitive ability is important for students to realize what they should do when making mistakes and evaluating their work. Students are expected to be able to assess the effectiveness of strategies implememted in the classroom. Through metacognition, the goal is to make students aware of the importance of questioning themselves (Naufal, Atan, Abdullah, & Abu, 2017).

There are differences in the learning activities which build metacognitive abilities in students who take part in learning, between activities that adopt Revised Bloom's classification-oriented learning and those which do not Learning activities in the experimental group adhering to revised Bloom's taxonomy gave students the freedom to develop their creativity; this has several advantages, including 1) student-centered learning activities, so that students can actively participate in learning, 2) learning activities based on goals that are clear and understood by students so that students are actively involved in learning, 3) learning activities face problems that need to be solved so students are able to carry out the discovery process and think deeply, 4) learning activities improve students' metacognitive abilities, so students have self-awareness in solving problems, because through this awareness students can find out whether the completion process is correct and to what extent the truth is, and students can evaluate the location of the error in solving the problem, 5) different learning activities are facilitated by appropriate, clear and relative learning media depending on the characteristics of students, materials and learning objectives, 6) learning activities invite students to interact socially, both between learners and teachers, learners and other learners, learners and the environment, 7) activities in learning are carried out starting from remembering, understanding, applying, analyzing, evaluating and creating, making it easier to measure student achievement in the process of learning. Learners are more active, independent, and responsible in completing the

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assigned tasks with these learning activities. Students are honest about their knowledge. If students make mistakes, they immediately correct them, and are honest about what they know and do not know. These revised Bloom's taxonomy-oriented learning activities can be used in higher classes with customized material and improved abilities. Students with metacognitive ability exert a positive influence on the process of learning of fellow learners as well.

An important finding of this research is the positive effect of Revised Bloom's classification-oriented learning activities on enhancing learners' metacognitive abilities. Learning activities in line with Bloom's revised classification have transformed learning from teacher centered instructions to students as the center of learning and requiring the students to be active in the classroom. The teachers only act as facilitators and motivators to provide guidance or facilitate students in learning. The teachers must be able to arouse students' desire to learn. Teachers also play an important role in the development of formal education, especially in schools. They have a very large influence on the learning process, one of which is student learning success. The role of teacher is needed as a moderator and motivator to achieve student learning goals (Esi, Purwaningsih, & Okianna, 2016; Rahmawati & Suryadi, 2019). Another characteristic of conventional learning is teacher-centered learning (teacher-oriented). As a result, the teacher becomes the only source of knowledge. Teachers always use the easiest method, namely the lecture method. The hallmark of this method is that students listen, then record what the teacher says and finally memorize the material (Handika & Wangid, 2013). The impact of conventional learning is that students become passive learners. They only listen to the teacher's explanations and note things that are considered important, so sometimes they do not understand the material presented. Conditions like this hinder students from growing and being creative, making them feel less motivated to learn and understand the material in depth.

4. Conclusion

Learning activities oriented to Bloom's revised taxonomy can have a positive impact on students' meta cognitive abilities. The opportunity provided by Revised Bloom's classification-oriented learning activities allow students to learn actively and to develop meta cognitive abilities. The students are able to reflect on their own abilities and be honest and confident about their knowledge.

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