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Learning Tool Project to Create PBL Model to Stimulate Computational Thinking Ability of Students

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| Tia Yolanda Lubis[1,*] | Bornok Sinaga[2] | Mulyono[3] |

[1,2,3] Education Department, Postgraduate program, Universitas Negeri Medan

[*]tiayolandalubis@gmail.com

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ABSTRACT

The aim of this research is to analyze the validity of learning tools developed by applying the PBL model to improve students' computational thinking skills at SMP Negeri 37 Medan and to analyze the effectiveness of learning tools developed by applying the PBL model to improve students' computational thinking skills at SMP Negeri 37 Medan. This research uses research and development (R&D) methods. The results show that in trial I, the posttest results of students' computational thinking abilities were obtained, namely, 11 students (36.7%) got the poor category, 11 students (36.7%) got the sufficient category, 8 students (26%) got the good category. .6%), and no students obtained the very good category. In trial II, there were no students who got the poor category (0%), 8 students got the sufficient category (26.7%), 8 students got the good category (26.7%), and there were 8 students who got the good category (26.7%). 26.7%), who received the very good category were 14 students (46.6%). So, it could be concluded that the learning tools developed by applying the PBL model to improve students' computational thinking skills at SMP Negeri 37 Medan are valid. Learning tools developed by applying the PBL model to improve students' computational thinking skills at SMP Negeri 37 Medan are practical.

KEYWORDS

PBL model; Computational Thinking Ability; research and development

INTRODUCTION

Reacting to the issues that emerge in arithmetic learning as portrayed over, particularly related to students' computational considering capacities which eventually lead to moo understudy learning results in arithmetic learning, it is fundamental for instructors or analysts to select learning that can alter this worldview. The primary step that can be taken by instructors is choosing an issue Based Learning Demonstrate which is one arrangement, since Arends (2008) states that a problem-based learning demonstrate could be a learning demonstrate with a understudy learning approach to bona fide and significant issues for understudies who serves as an establishment for understudy speculation and request, so that understudies can develop their possess information, create higher aptitudes and request, make understudies free, and increment understudy self-confidence. This demonstrate is characterized by utilizing genuine life issues as something and moving forward basic considering and problem-solving abilities, as well as picking up information of critical concepts (Yadav, A., Mayfield, C., Zhou, N., Hambrusch, S., & Korb, J. T., 2014).

Problem-based learning is an interaction between boost and reaction, and could be a relationship between two learning headings and the environment. The environment gives input to understudies within the shape of offer assistance and issues, whereas the brain's

nerves work to decipher this offer assistance effectively so that the problems confronted can be explored, surveyed, analyzed and arrangements found well. Besides, concurring to Arends (Trianto, 2010) problem-based learning could be a learning approach where understudies work on bona fide issues with the point of compiling their information, creating request and higher-level considering aptitudes, creating autonomy and self-confidence.

The PBL show has a few characteristics that separate it from other learning models. An unmistakable highlight of this show is the utilize of issues as a learning asset and instructing is carried out through gather dialogs. Rusman (2016) states the steps in PBL as takes after: (1) arranging understudies to an issue, (2) organizing understudies to memorize, (3) directing students' encounters, (4) creating and presenting students' work, and (5) analyzing and assessing (Rusman, 2016). Instructing with the PBL show starts with a issue, at that point understudies enhance their information approximately what they as of now know and what they have to be known to illuminate the issue. Issues that are utilized as the center of learning can be unraveled through bunch work so that understudies can give shifted learning encounters such as participation and interaction in bunches. Having genuine issues given will make educating student-centered, dynamic and significant. This condition appears that the PBL show requires arrangement, both instructors and understudies. Instructors act as facilitators and guides, whereas understudies must be effectively and freely included in learning by optimizing their considering capacities. In other words, the use of PBL can increment students' considering abilities and freedom in learning what they are learning.

Through PBL, understudies are required to be gifted at inquiring and communicating conclusions, finding important data, finding a few elective ways to discover arrangements and deciding the foremost compelling way to unravel issues. Typically, Sugandi et al (2013) and Wulandari (2015) who expressed that there's a positive and critical impact of actualizing PBL on understudy learning autonomy. With autonomous learning, understudies ended up tireless in confronting issues and are spurred to select reasonable procedures to unravel these issues. Amalia expressed that one of the vital considering abilities that understudies procure is higher arrange thinking skills (Sonda, R., Alimuddin, & Asdar, 2016). Usually since high-level considering abilities are one of the stages in thinking that cannot be isolated from standard of living and each understudy is coordinated at acing high-level considering abilities since it makes somebody able to think fundamentally and think fundamentally. imaginative in tackling a issue in his life. This is often exceptionally imperative for understudies to have, so through this investigate the impact of PBL on high-level science considering and understudy learning autonomy in basic schools is examined through exploratory inquire about.

Moreover, the comes about of Mulyati, S (2022) inquire about, prepare the computational considering expertise using problem-based learning worksheet for undergraduate physics students in computational material science courses, expressed that problem-based learning (PBL) is one of the techniques that's broadly utilized in exercises to move forward computational thinking because it has characteristics. to bring bona fide issues into the classroom. PBL conditions a collection of important data and problems in one well-described unit. This is what makes PBL an option for use in important learning for adults, such as undergraduate students. The PBL language structure is as follows: reviewing the explanation of the problem; answer questions and factors; devise a plan to explain the problem; building models; test the demonstration; make some proposals and reflect on problem-solving handles. These steps are closely related to the Computational Consideration capacity (Mulyati, S., 2022).

RESEARCH METHODS

It asks about workforce research and development (R&D) strategies. In agreement with Sugiyono (2015), investigation and improvement strategies are investigative strategies used to create certain items and test the adequacy or suitability of these items. It asks about the use of the 4-D show (Four D show) created by Thiagarajan, S., et al (1974) showed that a development show consisting of four stages including characterization, planning, creation and deployment. has been adjusted to provide a progress view appropriate to this investigation.

This search will be carried out at SMP Negeri 37 Medan, which is one of the junior high schools in Medan City, North Sumatra Region. The study was carried out in class VII in the odd semester of the 2023/2024 academic year on the material on straight one variable requirements, by changing the arithmetic lesson hours in that lesson.

The subjects of this research are science learning experts, and students of class VII of SMP Negeri 37 Medan for the 2023/2024 academic year, while the objects studied are Issue Based Learning based learning tools which are demonstrated in straight conditions with one variable, and computing takes talent into consideration.

RESULTS AND DISCUSSION

The item of this investigation may be a learning apparatus that applies the PBL demonstrate to one-variable direct condition fabric for lesson VII understudies of SMP Negeri 37 Medan. This investigates plan employments the 4-D show (Four D demonstrate) created by Thiagarajan, S., et al (1974) said that an advancement show consisting of four stages which incorporate characteristic, plan, create and spread.

Trial I

Module improvement that analyzed the accomplishment of learning goals was carried out to decide the rate of accomplishment of learning targets for each Posttest address thing on students' computational considering capacities. Accomplishment of posttest learning goals for computational considering abilities in Trial I can be seen in table 1:

Table 1. Description of the Results of Students' Computational Thinking Ability in Trial I

Max Score	Students' Computational Thinking Ability			
	X_{min}	X_{maks}	$\bar{x}$	S
100	39,71	79,41	62,45	12,47

Based on Table 1, it shows that the average student computational thinking ability in the posttest results in Trial I was 62.45 with a standard deviation of 12.47. If categorized based on the level of student mastery, then the level of mastery of students' computational thinking abilities in the posttest results of Trial I can be seen in Table 2.

Table 2. Level of Mastery of Students' Computational Thinking Ability Posttest Results from Trial I

No	Score Interval	Student Computing Ability		Description
		Students	Percentage	
1	0 ≤ SKBKM < 55	11	36,7%	Less
2	56 ≤ SKBKM < 75	11	36,7%	Enough
3	76 ≤ SKBKM < 85	8	26,6%	Good
4	86 ≤ SKBKM < 100	-	-	Very Good

Based on Table 2, the posttest results of students' computational thinking abilities were obtained, namely, 11 students (36.7%) got the poor category, 11 students (36.7%) got the sufficient category, 8 students (26%) got the good category. .6%), and no students obtained the very good category.

The most dominant level of students' computational thinking abilities from the posttest results from Trial I was the poor category, followed by the good category, and the last one was sufficient. Furthermore, the results of classical completion of students' computational thinking abilities in Trial I can be seen in Table 3:

Table 3. Level of Achievement of Students' Computational Thinking Ability in Trial I

Category	*Posttest* Students	Percentage of Students' Computational Thinking Achievement
Complete	9	30%
Not Completed	21	70%
Amount	30	100%

Trial II

Table 4. Description of the Results of Students' Computational Thinking Ability in Trial II

Max Score	Students' Computational Thinking Ability			
	X_{min}	X_{maks}	$\bar{x}$	S
100	61,76	100	84,71	9,48

Based on Table 4, it shows that the average computational thinking ability of students in the posttest results was 84.71 with a standard deviation of 9.48. If categorized based on the level of student mastery, then the level of mastery of students' computational thinking skills in the posttest results of Trial II can be seen in Table 5:

Table 5. Level of Mastery of Students' Computational Thinking Ability Result of Posttest Trial II

No	Score Interval	Students' Computational Thinking Ability		Descripton
		Students	Percentage	
1	0 ≤ SKBKM < 55	0	0%	Less
2	56 ≤ SKBKM < 75	8	26,7%	Enough
3	76 ≤ SKBKM < 85	8	26,7 %	Good
4	86 ≤ SKBKM < 100	14	46,6%	Very Good

Based on Table 5, the posttest results of students' computational thinking abilities in Trial II were obtained, namely, there were no students who got the poor category (0%), 8 students got the sufficient category (26.7%), 8 students got the good category (26.7%), and there were 8 students who got the good category (26.7%). 26.7%), who received the very good category were 14 students (46.6%).

Based on Table 4, it is found that the most dominant level of students' computational thinking abilities from the Trial I posttest results is the very good category, followed by the sufficient category, and finally the good category. Furthermore, the results of achieving students' computational thinking abilities in Trial II can be seen in 6:

Table 6. Level of Achievement of Computational Thinking Ability in Trial II

Categories	*Posttest* Students	Classical Completion Percentage
Complete	27	90%
Not Complete	3	10%
Total	30	100%

According to Hasratuddin (2018) states that indicators of learning effectiveness are based on achieving learning completeness if > 80% of students have completed it, the time utilized in learning is proficient or does not surpass typical learning, and students' reactions to learning are positive.

It was found that students' computational considering capacities had met the classical criteria for completeness. This is often since the fabric and issues within the learning show are created in agreement with the conditions of the student's learning environment. By utilizing this learning apparatus, understudies will more effectively understand the fabric on straight conditions in one variable. Accomplishment of the ultimate test of students' computational considering capacities in Trial I was 30% with 9 understudies announced total. In Trial I, the application of learning instruments utilizing the PBL show created did not meet the criteria for accomplishing classical completeness (>80%). However, in Trial II, students' accomplishment within the last test of computing capacity met the required criteria, specifically 90% with a add up to of 27 understudies being announced total. So, it can be said that learning apparatuses that apply the PBL show have met the adequacy criteria within the viewpoint of accomplishing students' computational considering abilities.

Typically bolstered by inquire about other research which states that the criteria for learning adequacy in terms of the N-gain score are within the medium category and students' classical completeness is more than 80% (Sonda, Alimuddin, and Asdar, 2016). By executing learning instruments utilizing the PBL demonstrate created by instructors within the early stages of learning and as long as they total their assignments, understudies will be ended up more dynamic in taking care of their learning errands, coming about in more viable learning and an effect on students' classical learning completion. Based on the inquire about comes about and the comes about of past inquire about over, it can be concluded that the learning instruments created by applying the PBL show to progress students' computational considering abilities at SMP Negeri 37 Medan have met the markers of viability in terms of students' learning completeness from the accomplishment of students' computational considering capacity tests.

Increasing Students' Computational Thinking Abilities

To determine the increase in students' computing abilities, data was obtained from the results of the initial test and final test of students' computing abilities in each trial. The increase in students' computing abilities is obtained from the normalized gain index data as follows:

$$N - Gain = \frac{posttest - pretest}{maxium\ possible\ score - pretest}$$

In Trial I, the average initial test of students' computing abilities was 47.27, and the average final test was 62.45, so the N-Gain value was as follows:

$$N - Gain = \frac{posttest - pretest}{maxium\ possible\ score - pretest}$$

$$N - Gain = \frac{62{,}45 - 42{,}27}{100 - 47{,}27}$$
$$N - Gain = \frac{20{,}18}{57{,}73} = 0{,}34$$

Meanwhile, in Trial II, the average initial critical thinking ability test was 45.31, and the final test average was 84.71, so the N-Gain value was as follows:

$$N - Gain = \frac{posttest - pretest}{maxium\ possible\ score - pretest}$$
$$N - Gain = \frac{84{,}71 - 45{,}31}{100 - 45{,}31}$$
$$N - Gain = \frac{39{,}39}{54{,}69} = 0{,}72$$

It is known that in Trial I there was an increase in students' computing capacity scores of 0.34 with direct criteria (0.3, an increase in students' computing capacity scores of 0.72 with high criteria (g > 0.7).

The examination of students' computational thinking ability tests in Trial I and Trial II, it was seen that there was an increase in students' computational thinking abilities. It normalized pick up. It is known that in Trial I there was an increase in students' ability to consider computing with "medium" criteria with a score of 0.34 (an increase in score of 0.3 with "high" criteria with a score of 0.72 (0.3 < N-Gain ≤0.7) So it can be concluded that learning devices that implement the PBL displays created can improve students' computing abilities.

The results of this research are strengthened by several past thoughts, especially questions conducted by Bai H, Wang. The research results of Marifah and Kartono (2023) show that PBL learning can advance student computing considering capacity. Apart from that, the research results of Litia, N., Sinaga, B., & Mulyono, M. (2023) show that the results of tests on students' computing ability levels using Issue Based Learning (PBL) show that the highest level of students' computational thinking abilities is in the medium category.

CONCLUSION

The learning tools was made by applying PBL model to improve students' computational thinking skills at SMP Negeri 37 Medan are valid. Learning tools developed by applying the PBL model to look up students' computational thinking skills at SMP Negeri 37 Medan are practical. The learning tools developed by applying the PBL model to improve students' computational thinking skills at SMP Negeri 37 Medan are effective. Thinking abilities become better and develop if you use PBL in learning tools. It also looks in average normalized gain, that was found that in trial I there was better progress in students' computational thinking abilities with the criteria "medium" and in trial II there was an increase in the score according to the criteria “high”.

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