Improving Student Learning Outcomes Through Stem-Based Magic Box Medium in The Concept of Addition Theory

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Abstract
The objective of the study is to determine the improvement of student learning outcomes through the media Magic Box (Magic Box) Based on STEM (Science, Technology, Engineering, Mathematics) on the concept of addition. The subject of the research was class I students in one of the Public Elementary Schools in Surakarta City Semester I of 2018/2019 Academic Year as many as 24 students, consisting of 7 male students and 17 female students. The method of the study was Classroom Action Research (CAR) with patterns: planning, implementing, observing, reflecting, and revising. The data were collected by using discussion, observation, tests, field notes, and documentation. Based on the results of the study, it was found that student learning outcomes had increased from cycle I to cycle II. The cycle I was 70.83%, and cycle II was 91.66%. The conclusion of the study is by using instructional media teaching aids Magic Box (Magic Box) Based on STEM (Science, Technology, Engineering, Mathematics) on the concept of addition theory can improve student learning outcomes in first-grade elementary schools in Surakarta City Semester I in the Academic Year of 2018/2019.
Keywords:
learning outcomes, magic box medium, STEM-Based, addition theory

INTRODUCTION

The current education paradigm is no longer teacher-oriented but has shifted to student-centered learning (Habimana & Stambach, 2015; Ahrari, et al., 2016). This implies that learning strategies in the 21st century must have a learning syntax that prioritizes the needs of students (Chukwuyenum, 2013; Mosher, et al., 2014;; Wulandari et al., 2014). Teachers as facilitators of learning in the school environment must be more creative and innovative in creating a learning climate in the classroom so that students would be curious (Smith, 2015; Cargas, Williams, & Rosenberg, 2017). The ability of teachers to explore student knowledge is needed so students are motivated to explore their potential through identification and analysis to produce critical thinking skills (Nargundkar et al., 2014; Syawaludin et al., 2019; Qomariyah, 2016).

The 2013 curriculum is learning-oriented to the development of 21st Century learning. 21st Century learning provides learning to students how to think (way of thinking), how to work (way of working), use of tools for work (tools for working),

and life skills (skill for living in the world). 21st-century learning as a reference for curriculum development in 2013 provides learning experiences oriented to the development of critical thinking skills (Kim & Song, 2013; Schoenberger-Orgad & Spiller, 2014; Noprianda, Noor, & Zulfiana, 2016). Critical thinking skills in students can be built through various strategies. One way to build critical thinking skills through STEM-based learning (Science, Technology, Engineering, Mathematics) in education (Jauhariyyah, et al., 2017; Ngabekti et al., 2019)

STEM learning (Science, Technology, Engineering, Mathematics) is learning that refers to an approach in education about science, technology, engineering, mathematics is integrated into the educational process that focuses on solving problems in daily life and professional life (Ghanberi, 2015; Bahrum et al., 2018). According to Jaka Afriana (2016) "STEM is a scientific discipline that is closely related to each other. Science requires Mathematics as a tool in processing data, while technology is the implementation of science." The implementation of STEM-based learning teaches students how concepts, principles, scientific techniques, technology, techniques, and Mathematics are used in an integrated way to develop products, processes, and systems that useful

for human life (Jho et al., 2016; Bahrum et al., 2018). Student learning experiences that are expected through STEM-based learning include mastery of knowledge, attitudes, and skills to identify questions and problems in student life, explain natural phenomena, design and draw conclusions based on evidence about problems related to STEM (Erwin, 2017; Bati et al., 2018).

STEM-based learning (Science, Technology, Engineering, Mathematics) has a close relationship with the development of 21st-century learning, so it is very important to apply it in the classroom (Immermen, 2011; Khaeroningtyas et al., 2016). STEM-based learning is one alternative learning that is potentially used to build 21st-century skills. STEM literacy-based learning can be covered in Inquiry Learning-based cooperative learning models (Setiawan, 2016; Fathulla, 2019)

THEORETICAL PERSPECTIVES

Research Method

The study was conducted with research subjects to class I students at Public Laweyan Elementary School, Surakarta in the Semester I of 2018/2019 Academic Year for 24 students, consisting of 7 male students and 17 female students. The method used in this study was Classroom Action Research (CAR) with patterns: planning, implementing, observing,

reflecting, and revising. The data was collected through the method of discussion, observation, tests, field notes, and registration. Data were analyzed from the implementation of actions developed during the reflection process to the preparation of the report. While the data analysis technique used was comparative descriptive analysis, which was requested by comparative descriptive analysis was an analysis that discussed the assessment of values between cycles with work indicators.

This class action research sets the following indicators of thriving:

1. If students have shown a 75% increase in learning outcomes after using STEM-Based Magic Box Media.

2. If students have shown a 75% increase in learning outcomes after using STEM-Based Magic Box Media

3. If students show 75% complete learning outcomes according to KKM standards after using STEM-Based Magic Box Media.

LITERATURE REVIEW

1. Learning Media

Learning media contains meaning as an introduction to the message from the source of the message in this case the teacher, to the recipient of the message in this case is the student (Mahnun, 2010; Adnan et al., 2017). Learning media is "software" in the form of messages or educational information that is presented by using a hardware device so that the message/ information can be received by students (Muhson, 2010; Sari & Setiawan, 2018). The learning media functions to present objects that cannot be seen by students directly or objects that are too micro to be seen directly, for example, enlarging small objects, presenting events that are located far away, complex, complicated, which directly rapidly or slowly become systematic and simple (Primasari, 2014; Ntobuo et al., 2018). Based on opinions it can be concluded that the learning media is a teaching media is a medium and channel of messages from teacher to student in the form of messages or educational information so that it can be seen immediately rapidly or slowly becoming systematic and simple.

2. STEM (Science, Technology, Engineering, Mathematics)

STEM literacy or scientific and technological literacy refers to the ability to apply scientific knowledge, identify problems and draw conclusions based on evidence to understand and make decisions about nature and natural changes as human activities in everyday life (Lee et al, 2013 ; Permanasari, 2016; Mutakinati & Anwari, 2018). STEM literacy refers to: (1) the

knowledge, attitudes, and skills of an individual to identify questions and problems in real life, describe something natural and design (natural and design world), as well as draw facts-based conclusions about issues - issues STEM, (2) an individual's understanding of the characteristics of STEM disciplines as a form of human knowledge, inquiry and design, (3) an individual's sensitivity about how STEM created our material, intellectual and cultural environment, and (4) an individual's desire to be bound in STEM issues and, are bound by ideas of science, technology, engineering, and mathematics as a constructive, caring and reflective citizen (Bybee, 2013; Lee et al., 2014; Suwarna, 2015; Katz-Buonincontro, 2018). "Science, Technology, Engineering, and Mathematics (STEM) is a new approach in the development of education that integrates more than one discipline" (Aldila, 2017; Bahrum et al., 2018). From the above opinions, it can be concluded that STEM learning is the ability to use science and technology to solve problems in real life and be able to draw conclusions based on evidence to create a constructive, caring and reflective personality towards nature and changes in nature as human activities in daily life.

3. Numeracy Literacy

Numeracy literacy is knowledge and skills to (a) use a variety of numbers and related symbols with mathematics basics to solve practical problems in various contexts of daily life and (b) analyze information displayed in various forms (graphs, tables, charts, etc.) and then use the interpretation of the results of the analysis to predict and make decisions (Ministry of Education and Culture, 2017; Chiu, 2018). One's mathematical literacy includes the ability to formulate, apply and interpret mathematics in a variety of contexts, including the ability to do mathematical reasoning and use concepts, procedures and facts to describe, explain or predict phenomena or events (Qasim et al., 2015; Levels, M. , Dronkers, J., & Jencks, 2017; Lei et al., 2018). From the two opinions above it can be concluded numeracy literacy is knowledge or skills in understanding mathematical concepts related to numbers and symbols so that they can solve problems and explain phenomena or events.

4. STEM-Based Magic Box Media Specifications

Learning for elementary school is identical to holistically learning, therefore learning must be presented attracting student motivation in learning. Interesting learning must be presented challenges,

especially in enhancing higher-order thinking skills and applying technology in solving real-life problems (Chiang & Lee, 2015; Mutakinati & Anwari, 2018). STEM-based learning (Science, Technology, Engineering, Mathematics) provides a more valuable learning experience because it builds the mindset of students to be more critical and creative and is skilled in applying technology as a tool in solving problems in real life (Chukwuyenum, 2013; Roberts et al., 2018).

The use of mathematics learning media by empowering STEM-based Magic Box learning media (Science, Technology, Engineering, Mathematics) in learning the concept of class I added in addition to improving student learning outcomes, on the other hand also to improve the culture of numeracy literacy in students (Levels, M., Dronkers, J., & Jencks, 2017; Liliawati

et al., 2018). The use of mathematics learning media by empowering STEM-based Magic Box media (Science, Technology, Engineering, Mathematics) is the result of the teacher's creativity, is expected to further encourage students' learning motivation because it is presented in the form of simple mathematical teaching aids which present the substance of STEM-based numeracy material (Science, Technology, Engineering, Mathematics) which are adjusted to the basic competencies that are the objectives of learning in each theme (Chiu, 2018; Kurup et al., 2019; Herro & Quigley, 2017).

FINDINGS AND DISCUSSION
Cycle I

The results of the observation and evaluation of student activities in the first cycle are as follows.

Table 1. Student Learning Outcomes in the Cycle I Learning Activity Magic Box Application based on STEM (Science, Technology, Engineering, Mathematics)

No	Score	Frequency	Percentage	Category	Description
1	90-100	6	25,00%	Excellent	Complete
2	80-89	11	45,83%	Good	Complete
3	70-79	7	29,16%	Sufficient	Incomplete
Total		24			
Complete		17	70,83%		
Incomplete		7	29,17%		

Based on table 1 above it can be seen that the total number of students that there

are 17 out of 24 students with a percentage of completeness of 70.83%. In Cycle I

learning activities have shown that student learning outcomes have improved by applying the STEM-based Magic Box media-based learning model (Science, Technology, Engineering, Mathematics), although it has not reached the completeness level standard of 85% of the total number of students.

Evaluation of actions in the first cycle of the results of observations, observations when implementing actions where the learning process occurs and the results of the evaluation of researchers and class teachers hold discussions including the conclusion:

a. students do not understand the concept of addition by using STEM-based Magic Box media (Science, Technology, Engineering, Mathematics) as a whole.

b. each student has not been able to practice optimally because of the limited time that has been provided

c. average test results do not meet the minimum standards for completeness.

Cycle II

The results of observations and evaluations carried out student activity activities in the first cycle of classroom action research as follows

Table 2. Student Learning Outcomes in Cycle II Learning Activity Magic Box Applications based on STEM (Science, Technology, Engineering, Mathematics)

No	Score	Frequency	Percentage	Category	Description
1	90-100	9	37,50%	Excellent	Complete
2	80-89	13	54,16%	Good	Complete
3	70-79	2	8,34%	Sufficient	Incomplete
	Total	24			
	Complete	22	91,66%		
	Incomplete	2	8,34%		

Based on table 2 above, it can be seen that the number of students who have completed 22 of 24 students with a percentage of completeness of 91.66%. In Cycle II learning activities have shown that student learning outcomes increase to the maximum. Improving learning by empowering through the use of media

Student Learning Outcomes in Learning Activities After the STEM-based Magic Box Application (Science, Technology, Engineering, Mathematics).

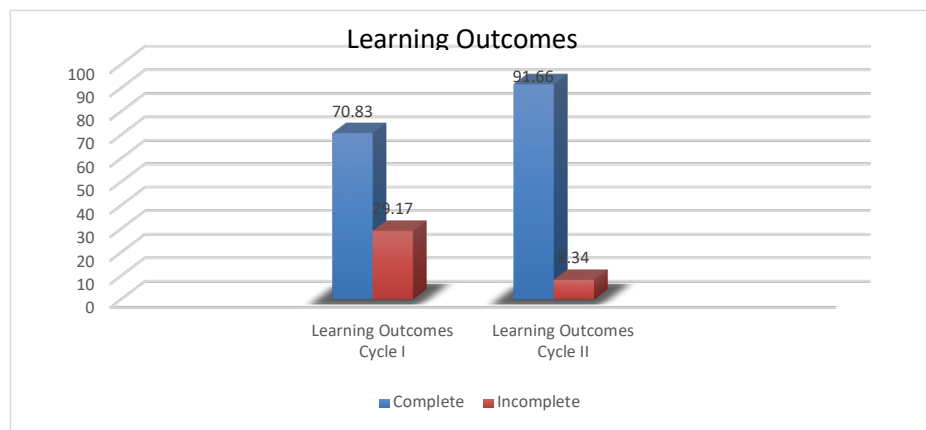Based on the results of the learning process activities through STEM-based Magic Box media (Science, Technology,

Figure 1. Graph of Application Results for Using STEM-based Magic Box Media (Science, Technology, Engineering, Mathematics)

Engineering, Mathematics) it is known that learning outcomes increase. In learning activities before applying STEM-based Magic Box media (Science, Technology, Engineering, Mathematics) it is known that student learning outcomes have not experienced changes, as evidenced by student learning outcomes still reaching completeness of 70.83% in Cycle I, this is due to learning activities haven't implemented STEM-based Magic Box (Science, Technology, Engineering, Mathematics). This is consistent with previous research that learning conducted before implementing STEM-based learning (Science, Technology, Engineering, Mathematics) results in student learning output not experiencing significant changes in achieving maximum levels of learning mastery (Suwandi & Istiyono, 2017;

Mutakinati & Anwari, 2018; Carlisle & Weaver, 2018).

Changes in student learning outcomes increase in learning outcomes after applying STEM-based Magic Box media (Science, Technology, Engineering, Mathematics), so that there are changes both in the activities of students and teachers, which in the end obtained student learning outcomes reach the level of completeness 91, 66% in Cycle II. This success describes quantitative results that the STEM-based Magic Box media (Science, Technology, Engineering, Mathematics) provides the effectiveness of learning in students so that it can improve student learning outcomes. These results are consistent with previous research that STEM-based media learning makes the learning process centered on students so that it can involve students 'learning

activeness in class, train students' skills in counting, communicate, students feel easier, understand the concept of learning so students have more experience, build knowledge so that students' self-development can be explored to improve student learning outcomes (Bati et al., 2018; Bahrum et al., 2018; Roberts et al., 2018). Learning in the classroom using STEM-based Magic Box media (Science, Technology, Engineering, Mathematics) is seen as an effective way to improve student learning outcomes (Khaeroningtyas et al., 2016; Herro & Quigley, 2017; Ngabekti et al., 2019).

CONCLUSION

Based on the results of the learning process activities through the STEM-based Magic Box media (Science, Technology, Engineering, Mathematics) it is known that learning outcomes increase, as evidenced by student learning outcomes still reaching the completeness of Cycle I 70.83%, this is because the learning activities have not implemented the Box Magic based on STEM (Science, Technology, Engineering, Mathematics). Changes in student learning outcomes increase in learning outcomes after applying STEM-based Magic Box media (Science, Technology, Engineering, Mathematics), so there are changes in both the activities of students and teachers,

which in the end obtained student learning outcomes reach the level of completeness Cycle II 91.66%.

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