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# The influence of science learning media based digital storytelling towards metacognition ability

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**Abstract.** Implementation of learning should provides opportunities for students to be able to develop metacognition ability. This study aimed to analyze the influence of Science Digital Storytelling media towards metacognition abilities of students. The study design used is Nonequivalent-Groups pretest-posttest control group. Samples selection are done by random sampling. This study had found that the metacognitive ability of students which consists of five levels of metacognition ability increases. N-gain is at the low category of the control class and was the experimental class. Relations Science Digital Storytelling calculations have been done and the r value obtained is 0, 85 which means that there is a strong relationship between Science Digital Storytelling to metacognition abilities of learners. The test results of the influence of media Science Digital Storytelling is obtained that sig-2 tailed 0.00 <0.05, it can be concluded that the media Science Digital Storytelling has a significant impact on metacognition ability.

## 1. Introduction

Education has an important role in people's lives to develop the nation. In Indonesia, the national education system designated in the National Education Number 20 the Year 2003. The education system is the foundation for teachers in delivering learning activities in the classroom that is implemented through of Curriculum 2013. Implementation of the study and implementation of Curriculum 2013 provides the opportunity for learners to be able to develop the ability of cognitive, affective, and psychomotor. The approach taken in the 2013 curriculum makes students more active to participate in the learning activities [1]. The learning activities are carried out on the curriculum in 2013 also refers to the process of reconstruction of knowledge by learners trough learning activity [2].

Metacognition in the learning process needs to be applied [3]. The readiness of teachers to design learning activities that match with criteria of metacognition approach has not been fully implemented optimally. Dewi [4] had analyzed learning materials needed by teacher at Boja Junior High School. She point out that learning materials based audio visual needed to develop to enhance student's metacognition ability. The results of observations in several school in Semarang Central Province of Indonesian show that learning activities still predominantly use the lecture method. Less lecture method to optimize the ability of learners to perform the reconstruction of science. Teachers at the school said that the lecture method performed on the material that has the characteristics of rote. Learning the topics



that have a lot of information to remember is still difficult to use other methods. One material that is more memorization is the Classification Topic.

Results of research on learning outcomes in the Classification Topic showed that the learning outcomes is under the criteria of mastery learning [5]. Methods and learning media are still limited to the material became the cause of learning outcomes in the Classification Topic [6]. The learning activities lectures also make learners do not see the object in real time, learners are unfamiliar with the terms used in the Classification therefore that learners experiencing difficulties. The application of media in conveying the Classification Topic is needed primarily to improve learners' metacognition.

Classification is using Science Digital Storytelling. Science Digital Storytelling comes from everyday stories and used to convey the meaning of these events, making the topic easier to understand [7]. Learning media taken from everyday phenomena through a process of inquiry can improve learning outcomes and improve the character of the students [8]. Science Digital Storytelling used in the learning process has a positive impact [8,10,11]. Experience in conducting activities developed by Digital Storytelling make students able to develop 21st-century skills consisting of literacy Information, Communication, Technology; critical thinking and problem-solving; communication and work together [9,12]. Dewi [13] who developed the teaching materials based on Science Digital Storytelling. The teaching materials based on Science Digital Storytelling in learning science is able to improve the learners' metacognition.

## 2. Literature Review

### 2.1. Media Science Digital Storytelling

Science Digital Storytelling is used as a medium of learning can help learners in constructing knowledge. Digital Science Storytelling provide benefits in learning. Science Digital Storytelling can be used to sharpen the skills of learners in terms of communicating both verbally and in writing [14]. Dewi [15] explained that the Science of Digital Storytelling can determine as the learning media in the form of educational films depicting the daily life of the students related to the topic or learning materials. The Component in digital storytelling are the point of view, the interesting question, the depiction of emotions in the story, the use of audio, music [16]. Digital Science Storytelling has three types of stories, the stories that are informative and contain values that can be learned from a story, a story about a person or character, and the story about the past or the history [17]. Media Science Digital Storytelling used in the learning process has a duration of 7-15 minutes.

### 2.2. Metacognition

Metacognition referred to as a set of knowledge that includes awareness of personal abilities, the general strategy used in performing different tasks (procedural knowledge), and knowledge about the condition [3]. Furthermore, metacognition defined as the "thinking about thinking" in person. Types of cognition regulate thinking and learning consist of three self-assessment skills which are, 1) the process of planning which invites students to predict whether they will have learned how the matter dominated and impression of what will be gained by the students for successfully carrying out the planning problem-solving. 2) monitor the process, the students have an awareness of how the problem can be solved and find out the cause when he had difficulty in solving the problem. 3) The process of assessing/evaluating which requires learners to make a reflection to determine the level of expertise in mastering a knowledge. The ability of metacognition is a person's mental activity in cognitive structures is done consciously by a person to control, regulate, and examine their own thinking processes [18].

### 2.3. Guided Inquiry

Model of inquiry with the level of guided inquiry provides an opportunity for learners to improve understanding of learners [19]. Learning science focuses on the efforts of learners in finding an object that is capable of directing the Integrating Science in the investigation process. An investigation of the

information would whet the curiosity, critical thinking skills and a high level. The inquiry learning model is derived from the English "inquiry", which means an investigation [20].

### 3. Methods

#### 3.1. Research Design

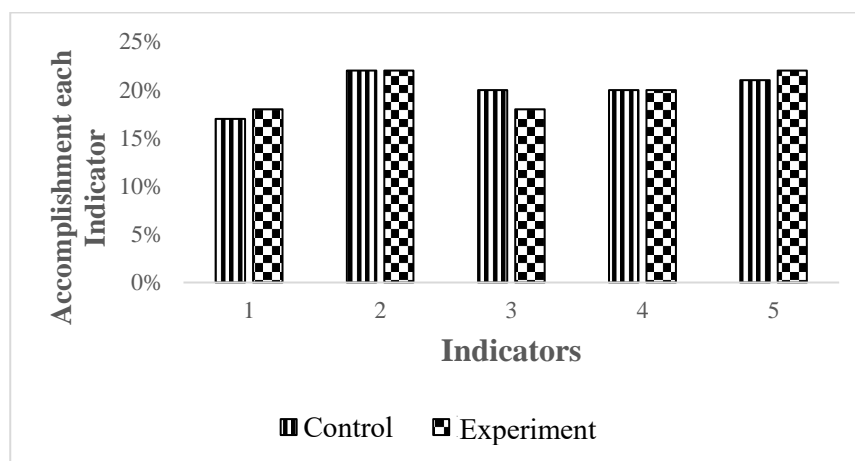
This study is a quasi-experimental design with Nonequivalent-Groups pretest-posttest control group. The sample used in this research is class VII C as the experimental class and class VII E as the control class. Sample selection is done by random sampling.

#### 3.2. Data Collection and Data Analysis

Data collection is done with test. The test method that used to obtain media Science Digital Storytelling influence on metacognitions' ability is multiple choices with reason. The influence of science digital storytelling on the ability of metacognition can be seen from the results of biserial correlation analysis.

### 4. Results and Discussions

Determination of the ability of metacognition based indicators at each level gives an overview achievement score on each indicator. Classification of metacognition abilities of participants based on the indicators metacognition is shown in Figure 1.



**Figure 1.** Metacognition ability based indicators

Description:

Indicator 1: Identify information

Indicator 2: Decide on the most appropriate operation

Indicator 3: Prepare and interpret data

Indicator 4: Apply the understanding at the new situations

Indicator 5: Linking the observational data with the discussion

Figure 1 shows the level of metacognition in students in the control class and experimental class in each of the indicators. Metacognition indicators used to determine the level of metacognition of students taken by [18]. Results showed that the experimental group was higher in the indicator 1, 2, 4, and 5. In indicator to 3 shows that the control group was higher than the experimental class.

The ability of metacognition learners also reviewed at each level. The achievement of metacognition ability to distinguish between the control and the experimental class. Percentage achievement metacognition abilities of students in the control class and experimental class is shown in Table 1.

**Table 1.** Distribution of metacognition level of students

Class		Accomplishment (%)				
		Level 1	Level 2	Level 3	Level 4	Level 5
Control	Pretest	13	19	25	16	28
	Posttest	13	22	28	22	16
Experiment	Pretest	16	31	22	13	19
	Posttest	13	16	13	25	34

Description:

Level 1: realize the process of thinking and being able to describe

Level 2: developing thinking strategies introduction

Level 3: reflect evaluative procedures

Level 4: transfer of knowledge and procedural experience in other contexts

Level 5: linking conceptual understanding with procedural experience

The results in the experimental class showed an increased ability to metacognitive learners at some level after learning to use the Science of Digital Storytelling. Based on the result of performance ability of metacognition of students in the second grade, the result that the ability of metacognition of students in the control group experienced an increase in level 2, level 3 and level 4 while at level 1 number of students who mastered that level still the same both before and after learning process and at level 5 has decreased. While the experimental class metacognitive abilities of students have increased at level 4 and level 5, whereas at level 1, level 2 and level 3 are decreased. Higher levels of metacognitive learners showed that metacognitive abilities possessed the better. Based on the results of Table 1 shows that the distribution of metacognition's ability in the experimental class increased on high levels which are 4 and 5. Metacognition ability learners at level 1, 2, and 3 shifts to level 4 and 5. In contrast, the control group showed that the ability their metacognition on high levels decreased. Metacognition abilities of learners who initially on the level 5 moved to level 2, 3, and 4.

Results achievement and the percentage of learners towards metacognition abilities of students in each indicator is shown in Figure 1 and Table 1. Obtaining the highest achievements of all indicators metacognition abilities both the control class and experimental class after learning indicator 2. Indicator 2 on the control class and experimental class have the same percentage which is 22%. Indicator 2 shows that learners are able to decide the most appropriate operation. This is because the height of achievement indicators Science Media Digital Storytelling facilitate their questions can provoke learners to plan the learning. This inducement contained in the initial questions that exist in the media about the "what" and "how". The facility provides an opportunity for learners to develop plans and strategies to address the question. Learners who have a learning plan would be easier to decide what action will be carried out during the learning process. Planning has arranged makes learners have goals in implementing the learning activities. In line with the research [21] that the students have the ability to state the purpose is obtained after the learning is done repeatedly. This makes the learners to increasingly dominate the ability of the indicator. Learners who have a learning plan would be easier to decide what action will be carried out during the learning process.

The experimental class at 3 indicators show a decline and the lowest indicators of achievement. The third indicator is the ability to compile and interpret data. Control class has the ability to interpret data is higher than the experimental class. But the percentage is not too significant. A third indicator representing the level of metacognition to reflect evaluative procedures. Previous report has found that the indicator compile and interpret data can be achieved by an increase in practicum [22]. Practicum able to improve the ability of learners through report writing lab results.

Activities at each indicator applied to the media Science Digital Storytelling. In the first indicator of the percentage of the value of identifying information obtained experimental class is higher than the control class. The ability to identify good information on the control class and experimental class trained during the learning takes place. Initial information presented in the learning activities carried out by the scope of the problem. The scope of the problem presented in the media Science Digital Storytelling

makes learners more easily caught. This is because the media is shaped audio-visual films which give a clear picture to the learners. According to [23], audio-visual media can increase the stimulus for learners to develop themselves in the learning process.

The relation between Science Digital Storytelling with metacognition abilities are known to test the correlation biserial. Based on the calculations have been done then obtained the r-value of 0.85, which means that there is a strong relationship between Science Digital Storytelling to metacognition abilities of learners. Science Digital Storytelling amount of influence on the ability of determination determined by the coefficient of determination obtained by 73.79%. Coefficient of determination value indicates that the ability of metacognition in students in the experimental class is influenced by the media Science Digital Storytelling and 26.21% are influenced by other factors.

Furthermore, the analysis is done to determine the relationship between media Science Digital Storytelling at every level of metacognition learners. The analysis was performed by calculating the value of r at each level. The relationship Science Digital Storytelling to metacognition abilities at every level are presented in Table 2.

**Table 2.** Table relation between science digital storytelling and metacognition level

Level	r Value	Categori	KD (%)
1	0,44	Average	19,65
2	0,66	Average	44,59
3	0,67	Average	44,96
4	0,56	Average	31,41
5	0,63	Average	40,60

Science Digital Storytelling in this research has the almost same result in relation toward to the metacognition abilities of learners. Science Digital Storytelling has the highest correlation to the ability of metacognition learners at level 3. The high value of media relations Science Digital Storytelling to metacognition abilities of learners at level 3 is 0.67. It shows that the media Science Digital Storytelling has the effect of 44.96% during the learning in improving metacognitive abilities of learners. Metacognition capability level 3 illustrates the ability of learners have reached the stage of reflection on evaluative procedures [18].

The test results of the influence of media Science Digital Storytelling is obtained that sig-2 tailed  $0.00 < 0.05$ , it can be concluded that the media Science Digital Storytelling has a significant impact on the ability of metacognition. These results are consistent with research Goddess [13] that the use of media Science Digital Storytelling has the effectiveness and improve the ability of metacognition learners. Niemi & Multisita [9] also added if Storytelling Digital media provide positive experiences to the learning process of students. Such experiences provide learners are self-motivated so that the learning outcomes that have been passed learners are able to improve the learning outcomes of students. Besides learning outcomes are influenced by motivation is also influenced by the ability of metacognition.

## 5. Conclusion

Based on the research that has been done, it can be concluded that the media Science Digital Storytelling has a strong influence on the metacognitive ability of learners. Achievement level of metacognition of students affected by the Science Media Digital Storytelling. Media Science Digital Storytelling provides the effect of the metacognition ability of 0.85. The coefficient of determination media Science Digital Storytelling is 73.79%.

## References

- [1] Pamelasari S, Nurkhalisa S, Laksmana S I 2018 *Int. Con. on Mathematics, Science, and Education* (Semarang: Indonesia)
- [2] Dewi N R, Nurkhalisa S, Savitri E N, Wibowo S W A, Dwijayanti I 2019 *J. Phys.: Conf. Ser.*

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- [3] Susantini E, Sumitro S B, Corebima A D, Susilo H 2018 *Asia Pac. Educ. Rev.* **19** 401-411
- [4] Dewi N R., Maghfiroh L, Nurkhalisa S, Dwijayanti I 2019 *J. Turk. Sci. Educ.* **16** 364-378.
- [5] Rohawati M 2012 *JPII* **1** 75-81
- [6] Istiani R M, Retnoningsih A 2015 *Unnes J. Biol. Educ.* **4** 70-80
- [7] Maddin E 2011 *J. Instr. Pedagog.* **5** 1-11
- [8] Nurkhalisa S, Ummayah F F D 2017 *IJSR* **6** 1396-1400
- [9] Niemi H, Multisita J 2015 *Technol. Pedagogy Educ.* 1-19
- [10] Shelton C C, Archambault L M, Hale A E 2017 *J. Digit. Learn. Teach. Educ.* 3358-68
- [11] Wilson D K, Hutson S P, Wyatt T H 2015 *Sage* 1-10
- [12] Thang S M, Mahmud N 2013 *Proc. of the 21st Int. Conf. Comput. Educ.* 240-245
- [13] Dewi N R, Kannapiran S, Wibowo S W A 2018 *JPII* **7** 16-24
- [14] Botturi L, Chiara B, Sara C 2014 *Int. J. Arts Technol.* **7** 92-111
- [15] Dewi N R, Savitri E N, Taufiq M, Khusniati M 2018 *J. Phys.: Conf. Ser.* **1006** 012020
- [16] Lambert J 2010 *Digital storytelling cookbook and traveling companion* (Berkeley, CA: Digital Diner Press)
- [17] Foley L M 2013 *Digital storytelling in primary-grade classrooms* *Doctoral dissertation* (Arizona: Arizona State University)
- [18] Haryani S 2012 *Membangun Metakognisi dan Karakter Calon Guru melalui Pembelajaran Praktikum Kimia Analitik Berbasis Masalah* (Semarang: Unnes Press)
- [19] Almuntaheri S, Gillies R M, Wright T 2016 *Sci. Educ. Int.* **27** 16-39
- [20] Wisudawati A W and Sulistyowati E 2015 *Metodologi Pembelajaran IPA* (Jakarta: Bumi Aksara)
- [21] Haryani S, Liliyasi, Permanasari A, Buchari 2010 *J. Pendidik. Mat. dan Sains* **1** 35-42
- [22] Sophianingtyas F, Sugiarto B 2014 *UNESA J. Chem. Educ.* **2** 1 21-27
- [23] Dewi N R., Wibowo S W A, Savitri E N 2017 *Unnes Sci. Educ. J.* **6** 1635-1641.