

Improving the Capability of Prospective Primary School Teachers in Making Science-Based Science Teaching Materials Based on ICT Media Assisted Literacy

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Abstract: In general, this study aims to improve the ability of prospective elementary school teachers to make science teaching materials based on ICT literacy based on ICT media. Specifically, to develop the ability of prospective elementary school teachers to make teaching materials based on scientific literacy. The method used in this study is a quasi-experimental research design using Nonrandomized pretest-posttest control group design. The population in this study were all PGSD IKIP Siliwangi semester 4 students. The sample in this study was 2 regular classes with 60 students. The instruments used include tests and observation sheets. The results showed that the value of learning using teaching resources based on ICT literacy based on ICT media is better than conventional learning.

Keywords: science literacy, teaching materials, ICT media

I. INTRODUCTION

Hayat and Yusuf (2010) mentioned that there are several international studies carried out to measure scientific literacy and become a benchmark for the quality of basic education today, including PISA and TIMSS. Although not the only quality reference in the assessment of education, many countries use the results of this study as a basis for the development of education in their countries. The following is a comparison of the PISA and TIMSS surveys on students' ability in science literacy (Table 1).

Table 1
PISA and TIMSS results in Indonesia

Results	Year	Posision Indonesia	Number of Countries	Score
PISA	2015	72	64	403
TIMSS	2015	35	49	397

The results of 2015 scientific literacy measurements, the value of science obtained by Indonesia is still below the average of 500. In other words, the ability of science in Indonesia is still far from expectations. The contributing factor is the still weak culture of science in Indonesia. It should be that mastery of science is not only focused on the mastery of the material alone, more broadly able to relate it to more complex science topics.

Developing scientific literacy, the need for special abilities to design appropriate learning. It should be, learning patterns that have so far only channeled learning into student activities. Learning is not only dominated by teachers; students must be actively involved in it. In the end, students are able to build their knowledge and understanding independently based on their direct experience.

Considering the importance of mastering science literacy, a prospective teacher must have the skills and

knowledge about the development of science literacy-based teaching materials especially in the environment of PGSD IKIP Siliwangi students. In connection with the above, one of the efforts that can be made in improving the ability of teachers to create teaching materials based on scientific literacy is to use ICT media.

The development of ICT literacy-based teaching materials based on ICT media is based on research conducted by Kelana (2017) with the results of the use of learning media can improve scientific literacy skills. Hidayani (2016) about the development of teaching materials based on scientific literacy of static fluid material with the results showing that teaching materials based on scientific literacy are easily understood by students.

From previous research there are gaps, including the absence of research that examines students as research subjects. For that we need improvements that can improve the literacy ability of PGSD IKIP Siliwangi students as future elementary teacher candidates. Based on this study, the formulation of this research are: (1) How is the influence of ICT literacy-based learning based on ICT media in PGSD IKIP Siliwangi students in the experimental class? (2) What is the effect of conventional learning in PGSD IKIP Siliwangi students in the control class? (3) How does the comparison of increasing understanding of science-based learning based on ICT media assisted with classes that apply conventional learning.

The objectives of this study are: (1) to determine the effect of ICT literacy-based learning based on ICT media in PGSD IKIP Siliwangi students in the experimental class; (2) to determine the effect of conventional learning in PGSD IKIP Siliwangi students in the control class; (3) to find out the comparison of increasing understanding of learning based on science

media assisted by ICT media with classes that apply conventional learning. From the explanation above, the researcher is interested in conducting research with the title increasing the ability of prospective elementary school teachers to make science teaching materials based on ICT literacy based on ICT media.

II. LITERATURE REVIEW

A. Science literacy

Science Literacy is derived from the word literatus which means marked with literacy or education and Scientia means having knowledge. The person who first introduced the term scientific literacy was Paul de Hart of Sandford University. According to Hart (in Toharudin, et al, 2011) scientific literacy is an act to understand science and apply it in everyday life. Meanwhile, according to Gallagher & Harsch (in Holbrook and Rannikmae, 2009) the term 'scientific literacy' has been used in literature for more than four decades, although Bybee revealed that the use of scientific literacy is not always with the same meaning.

From the above opinion explains that the use of the word literacy initially refers to the ability to read, write and count. But with the rapid development of science, the term began to develop. Paul de Hart popularized science literacy as an ability that was not only limited to reading, writing and arithmetic. Humans must have an understanding and application of science in their lives. There are several different definitions of scientific literacy, this is due to the point of view, and the intent and purpose. In addition, there must be an assessment in determining someone has mastered scientific literacy. This is an evaluation of the achievement of objectives. PISA identifies and collaborates on scientific literacy assessment into three main areas of scientific literacy, including: (1) science process; (2) science content; and (3) the context of the science application.

B. Teaching Materials

According to Majid (2008) teaching materials are everything that teachers use in carrying out learning activities in class. Whereas Sudjana and Rivai (2010) argue that teaching materials are all things that are used by someone in the learning process, either directly or indirectly, in part or in whole. From this opinion it can be concluded that teaching materials are all things that can be used and used in the learning process either directly or indirectly, written or oral.

C. ICT Media

UNESCO defines ICT as a combination of information technology and information technology. Whereas Halidi (in Kelana, 2018) say that ICT media is a means that can help teachers to convey messages / information or transfer knowledge to students. It can be concluded that ICT media is a medium that can be used by a teacher in disseminating all information with the help of technology.

III. METHOD

The method used in this research is quasi-experimental. The research design used was Nonrandomized pretest-posttest control group design.

According to Sugiyono (2018) the design drawings are as follows (Table 2).

Table 2
Research Design Nonrandomized Pretest-Posttest
Control Group Design

$\frac{O_1 \ X \ O_2}{O_3 \ O_4}$

Note:

- O1 = Pretest the experimental class
- O3 = Pretest the control class
- X = Treatment
- O2 = Posttest experimental class
- O4 = Posttest control class

The study was conducted at IKIP Siliwangi Bandung, West Java, Indonesia. The population in this study were all semester 4 PGSD students. The sample in this study was 2 PGSD classes with a total of 60 students. The instruments used include observation instruments that are adjusted to the indicators of the ability to make teaching materials based on scientific literacy. Instruments that have been made are validated to experts and tested in the field. The instrument used was then processed and analyzed using SPSS application assistance.

IV. RESULT

Research results on improving the ability of students to make science teaching materials based on ICT literacy based on ICT media show an increase in ability in the experimental class. This can be seen from the results of data processing below (Table 3).

Table 3
Descriptive Statistics of Pretest and Posttest Value for
Experiment Classes

Test	Ideal	Value
Pretest	100	34
Posttest	100	52.17

Based on Table 3, the average pretest score is 34 and the average posttest score is 52.17. To find out whether or not there are differences in the ability of beginning and end in the experimental class, then continued testing using the help of the application SPSS. T test statistic processing obtained sig data. (2-tailed), i.e. 0,000 < 0.05. Thus, it can be concluded that the ability of students to make science teaching materials based on ICT literacy based on ICT media has increased. The t test statistic processing data are as follows (Table 4).

Table 4
T Test Results in the Experimental Class

T test Experiment class	Sig.(2-tailed)	Significance
Pretest	.000	.05
Posttest		

Research results on improving the ability of students to make science teaching materials based on scientific literacy with conventional learning show an increase in ability in the control class. This can be seen from the results of data processing below (Table 5).

Based on Table 5, the average pretest score is 30.16 and the average posttest score is 44.50. To find out

whether or not there are differences in the ability of beginning and end in the control class, then further testing is done using the help of the application SPSS. T test statistic processing obtained sig data. (2-tailed), i.e. $0,000 < 0,05$. Thus, it can be concluded that the ability of students in making science teaching materials based on scientific literacy with conventional learning has increased. The t test statistic processing data are as follows (Table 6).

Table 5
Descriptive Statistics of Pretest and Posttest Value of Control Classes

Test	Ideal	Value
Pretest	100	30,16
Posttest	100	44,50

Table 6
T test Results in the Control Class

T test Experiment class	Sig.(2-tailed)	Significance
Pretest	.000	.05
Posttest		

To see the extent to which an increase in students' ability to make teaching materials based on science literacy in the control class and the experimental class, it is necessary to do further data processing using the N-gain t test statistics. The N-Gain t-test statistical processing data are as follows (Table 7).

Table 7
Descriptive Statistics of N-GAIN Values

Class	Sig.(2-tailed)	Significance
Experiment	0,010	0,05
Control		

The data above shows that there are differences in the ability of students to improve teaching materials based on scientific literacy in the control class and the experimental class.

V. DISCUSSION

During the research conducted many researchers found the findings, including relating to improving the ability of students to make teaching materials based on scientific literacy. Increased ability to make teaching materials based on scientific literacy in the experimental class, obtaining an average score of pretests is 34. Based on this without treatment, students in the experimental class already have the ability to make teaching materials based on scientific literacy by 34%. The treatment given to the experimental class was ICT assisted learning. At the time of the first meeting doing learning, students still look rigidly following the learning given by researchers. In addition, the ICT media used was constrained so that the learning process was also a little choked up. Weaknesses at the first meeting are then used as evaluations for improvements to the next meeting. At the second meeting, students began to get used to the learning provided so that interaction between researchers and students actively emerged. ICT-based learning is able to stimulate students to see, hear, observe and make their own teaching materials based on scientific literacy. As DePorter, Reardon, and Nourie (2000) stated that we learn: 10% of what we read; 20% of what we hear; 30% of what we see; 50% of what we see and hear; 70% of what we say; and

90% of what we say and do. In other words, learning will feel more meaningful if it involves all the senses that are owned. The final result expected is the creation of learning that can see students find their own concepts, so that learning feels more meaningful and longer remembered by students. This result is supported by the posttest in the experimental class which shows that there is an increase in the ability to make teaching materials based on scientific literacy by 52.17.

Not much different as in the experimental class, learning in the control class was initially experiencing difficulties, this was because the classroom conditions were not conducive, students were still looking lazy when the learning process took place. The biggest factor that becomes an obstacle when the learning process arises from the students themselves, learning motivation factors become the researcher's attention. To arouse students' learning motivation and attention, researchers play games before learning is given. With the right approach these problems can be overcome. In the control class, learning uses the lecture and presentation method. Based on the results of the study, it is hoped that this research can have implications such as: (1) learning based on ICT literacy based on ICT media can affect the ability of PGSD IKIP Siliwangi students in making teaching materials; (2) conventional learning in students can affect the ability of PGSD IKIP Siliwangi students; and (3) increasing the understanding and creativity of PGSD IKIP Siliwangi students in making innovative teaching materials.

Based on the results and findings of the research described earlier, the conclusions of this study are: (1) there is an increase in understanding in the experimental class with teaching materials based on ICT literacy based on ICT media; (2) there is an increase in understanding in the control class with teaching materials based on scientific literacy with conventional learning; and (3) increasing understanding of ICT literacy-based learning based on ICT media is better than classes that apply conventional learning.

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REFERENCES

- [1] Majid, A. Learning Planning. Bandung. PT Remaja Rosdakarya, 2008.
- [2] DePorter, B., Reardon, M & Singar-Nourie, S. 2007. Quantum Teaching. Practicing Quantum Learning in Classrooms. Bandung: Kaifa.
- [3] Sudjana and Rivai. Teaching Technology. Bandung: Sinar Baru Algensindo, 2010.
- [4] Hayat, Bahrul and Yusuf, Suhendra. International Benchmark Quality of Education. Jakarta: Bumi Aksara, 2010.
- [5] Hidayani, F. Development of Teaching Materials Based on Static Fluid Science Literation Materials. Under Graduates thesis, Semarang State University, 2016.
- [6] Toharudin, Uus., Hendrawati, Sri and Rustaman, Andrian. Building Student Literacy. Bandung: Humanities, 2011.

- [7] Holbrook, Jack and Rannikmae, Miia. The Meaning of Scientific Literacy, *International Journal of Environmental & Science Education*, 4(3), 275-288.
- [8] Kelana, J. B. (2018). The Effect of the Learning Media and the Ability to Think Creative of to the Ability to Science Literacy Student of Elementary School. *PrimaryEdu-Journal of Primary Education*, 2(2), 79-86.
- [9] Sugiyono. *Statistics for Research*. Bandung: Alfa Beta, 2010.
- [10] Unesco. *ICT and Learning: Reference*. Jakarta, Unesco, 2012.