The Implementation of Scientific Approach Learning Model Using Real Object And ICT Towards Biological Literacy in the Urinary System Subject in SMA Yogyakarta

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Abstract. The research aims to examine the difference between the implementation of Scientific Approach using real object and ICT towards biological literacy in the urinary system for the eleventh grade of Senior High School students. This study is a quasi-experimental research that was designed with non-randomized comparison group pretest - post-test design. The study took place in two Public Senior High Schools in Bantul. There are three classes as the subject of this research: real object class, ICT class, and blended class. The instrument used is observation sheet of science process skills and biological literacy ability test in the form of knowledge and implementation using pretest and posttest. Then the data were analyzed using Kruskal-Wallis test. The results show that the learning process implementing scientific approach using real object and ICT have significant difference towards biological literacy in the urinary system subject for eleventh grade of Senior High School students, with basic skills that have been developed, integrated skills that have not been developed yet, and towards knowledge and implementation aspect, have effect on increasing literacy in the low category of each class seeing from gain-score with average rate of real object class around 68,07, ICT class up to 71,19 and blended class reaches 52,93.

Keywords: real object, ICT, blended, scientific approach, urinary system, SMA Bantul

1. Introduction

Early preparation for 21st century skills needs to be prepared. In order to gain successful in 21st century, literacy improvement is needed. The meaning of literacy is defined as the ability to understand, make decisions based on information, and take action regarding to topic and complex problems faced by today's society (McBride et al., 2013:2). According to Organisation For Economic Co-operation and Development (OECD) (1999), scientific literacy includes three aspects: scientific process, scientific concept, and situation or contexts.

Biology learning is one of a group in science. Biological literacy is considered as an important part that students must have to be ready in facing the 21st century challenges. To improve the biological literacy that is part of science, the most important thing is to make students interested so that their attitude towards science will always develop, even when they are outside school (DeBoer, 2000:583).

Learning biology itself is learning about living things. The eleventh grade of Senior High School students in learning biology need a concept that is easily understood and has an interest in learning it. So, good biology learning is by using real object (RO).

Scientific approach learning model is considered as a good means to facilitate students in learning using real object. Since the scientific approach is the implementation of students' scientific skills that is obtained through 5 learning activities, namely: observing, asking question, collecting data, reasoning, and communicating or commonly called 5M.

Learning biology based on real object has been tested in previous research. The results are useful to motivate students in learning biology and identify the characteristics of object accurately (Suyanto, 2018). However, when the students conceptualize, their observations are not enough. They need data and other information.

The use of internet and website is needed during process of learning. Information obtained from the internet is combined with information from real object will help students develop biological concepts. Besides, by applying scientific approach using 5M during learning process, the students face an obstacle in the aspect of reasoning. Since reasoning needs to be discusses with some theories that refers to existing standard, thus additional information is needed from Information and Communications Technology (ICT). So, the process of learning becomes better when applying real object assisting by ICT that is called blended learning.

Therefore, this research aims to examine the impact of scientific approach learning model using real object and ICT towards biological literacy in the urinary system subject for the eleventh grade of Senior High School students in Yogyakarta.

2. Research Method

2.1 Types of Method

This study is a quasi-experimental research that was designed with non-randomized comparison group pretest - post-test design.

2.2 Research Setting

This research was conducted in March-April 2019 at two public Senior High Schools in Bantul, Yogyakarta.

2.3 Population and Sample

The population of this research is all eleventh grade students at two public Senior High Schools in Bantul, Yogyakarta. The sample of the study comes from three classes of eleventh grade students from each school.

2.4 Research Variable

The independent variable in this study is learning media applying scientific approach using real object and ICT. The dependent variable in this study is the ability of biological literacy including the ability of science processes, knowledge, and implementation.

2.5 Research Procedure

The study was conducted to compare the three different classes using three different learning media, namely real object, ICT, and blended. Before learning, the students are given pretest question, then after the learning process they are given post-test question. This aims to determine the enhancement of biological literacy in aspects of scientific concepts and contexts. As for aspects of the scientific process, it is perceived by observation.

In this study, the real object media used were goat kidneys, while the ICT media used were video and material in the form of power point slides.

2.6 Data, Instruments and Data Collection Techniques

The data obtained in this study are the results of the pretest and posttest and the results of observation. Data collection instruments in this study were conducted with a validity test through expert judgment techniques.

2.7 Data Analysis Technique

Science process skills (KPS) data in the form of observations are described in an expository manner. Then the data were analyzed using scoring technique that refers to Arikunto (2016: 65).
Then the scoring results are added up so that a percentage of each KPS is obtained. The following is a categorization of the results of the PPP percentage.

Table 1. Percentage of KPS Categories

Percentage	***Category***
≥ 85	Excellent
70 - 85	Good
55 - 70	Satisfactory
40 - 55	Fair

As for the results of the pretest and posttest scores, statistical analysis was implemented. Statistical analysis was performed with the help of the SPSS (Statistical Product and Service Solutions) program version 20.0 for Windows. Whereas the Gain Score Test is carried out using the following formula.

$$g = \frac{Xposttest - Xpretest}{Xmaksimal - Xpretest}$$

After knowing the value of the gain score, the data can be interpreted in the following table.

Table 2. Interpretation of Gain Score Test

Gain Score Ternormalisasi	***Interpretation***
0,70 < g < 100	High
0,30 < g < 0,70	Average
0,00 < g < 0,30	Low
g = 0,00	Stable
-1,00 < g < 0,00	Decrease

Rostina in Nismalasari et al. (2016: 83)

3. Research Results and Discussion

Research data obtained is in the form of biological literacy data that includes science process skills, knowledge, and implementation.

Based on the interpretations of the observation sheet related to the implementation of the process skills carried out by the researcher, it reveals different results. In every aspect of basic and integrated skills, all of the aspects have been fulfilled. There is only one aspect that is not met, namely the aspect of conducting experiments on integrated skills in ICT class. This case happens as the ICT class does not conduct experiment.

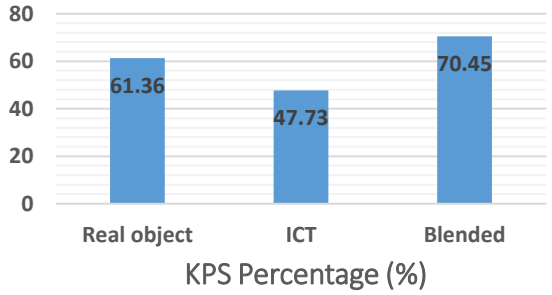

Figure 1. Percentage Results of Science Process Skills

Based on the sketch results, learning using real object media reaches 61.36% in total that is considered as fair category, then learning using ICT media reaches 47, 73% in total that is categorized as poor category, while learning using blended media is categorized as good one since it reaches 70, and 45% in total. It can be seen that the percentage of ICT classes is lower than the others. This fact happens because in this research, the learning does not cover all the aspects of science process skills. So there are some aspects that have not been implemented.

Furthermore, the results of the pretest and posttest were analyzed using statistical analysis. Firstly, the data were analyzed using descriptive analysis. The results of the pretest and posttest scores are illustrated in the diagram below.

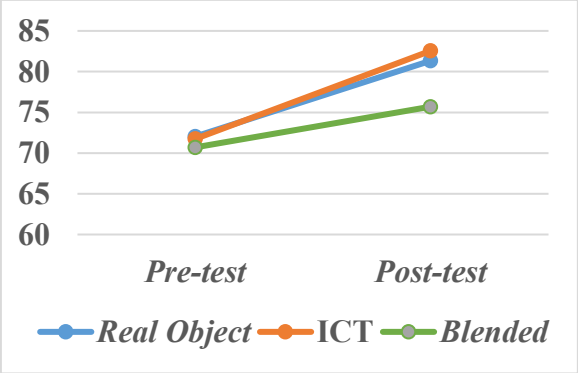

Figure 2. Difference Average of Pretest and Posttest in Real Object, ICT, and blended class

The diagram shows that the students score has increased after they have been given various learning media. Based on the diagram, it can be seen that ICT media has improvement and a high average score.

Secondly, a statistical test is applied to determine the influence on the use of the learning media. The results of the statistical analysis present that there are significant differences between each of learning media if the p value of less than or equal to 0, 05 ($p \leq 0, 05$). Kreskas Wallis test shows that scientific approach learning media using real object and ICT give a real effect towards biological literacy in the urinary system with significance value $p \leq 0, 05$. This significant result was followed by a further gain score test, with the following results.

Table 3. Pretest and Protest Score Increase with Gain Score Test

Media	N-*Gain score*	Interpretation
Real object	0,20	Low
ICT	0,28	Low
Blended	0,10	Low

Based on the Gain Score test, the students score is considered as low category. Meanwhile, if seen from the average, the ICT class experienced the greatest increase.

Learning biology applying scientific approach using real object and ICT is more beneficial and interesting for students since applying real object means that the students can see the object directly, and then if it is not visible on the direct object, they still can gain some information through ICT. Those media will motivate the students to explore and match the object. This fact is relevant to Piaget (Sanjaya, 2013:196) who states that knowledge will be valuable when it is searched and discovered by students.

Leaning using real object has an influence towards students' biological literacy especially in the matter of urinary system. This fact is relevant to Arief S. Sadiman (1990:16), who states that real object

has some benefits, including giving an explanation of the message agreement so that it is not verbal, supervise the limitations of space, time, and sense power so that it can lead students to positive attitudes, and also can provide the same stimulus that can equalize experiences and cause the same perception in students. In addition, based on a research conducted by Awaliya (2014:4), it indicated that the real object provides a good and effective impact for learning.

Besides learning using real object, ICT also has an influence towards students' biological literacy in urinary system. By applying ICT, the media can be used to support the learning and can be used as an additional source for the next material. This reinforces the study conducted by Rasyid et.al. (2016:79) who state that ICT is a media that gets positive responses from students for learning, and has an effect on increasing student learning outcomes.

Furthermore, when the real objects and ICT is combined, it is called blended learning in which this media also influence the students' biological literacy. This proves that ICT is be able to support the learning based on the scientific approach using real objects, mainly as a source of additional information for the real object being studied. In addition, using real objects and ICT media provide more functions for students such as manipulative functions. According to Munadi (2013:37), real object and ICT are overcoming the limits of space and time and overcoming sensory limitations. This proves that the combination of the real objects and ICT does have an influence on biological literacy.

Based on the results of this study, learning with ICT media provides a better improvement compared to real object and blended media. If based on the research hypothesis of the researcher, it is expected that blended media is the one that provide good results improvement. However, ICT media provide a better effect than real object and blended. It is can be interpreted that the use of ICT media itself has given good results without being combined by the use of real object media. This is happened because as the interview from one of the teachers, during learning, students are often used ICT in learning. In addition to ICT, the media is able to display objects that actually do not have physical appearances or called imagery. According to Herlanti in Munadi (2013:150), learning that uses mental imagery can increase the student' retention in remembering the subject matter. While the blended learning that is expected to give good results but it is not, it can be caused as when the learning processes happen the situation in the classroom is not conducive, beside the students in the classroom have low motivation to learn and not all the students participate in the learning process. So that it can affect on the results of the student grades.

In this research, class with ICT media has a good biological literacy compared to real object class and blended. It can be concluded that the use of ICT itself is approaching the real learning object when seen in terms of visualization. So that the role of real objects is not in terms of visualization, but plays a role in other aspects such as aspects of science process skills. This can be seen in Table 4 that KPS in ICT is in the satisfactory category, because the learning object has been replaced by ICT. Besides in the blended class, KPS is in the good category, because in the blended class, the existence of real objects supports the implementation of KPS. This is relevant with Helen (Rustaman, 2005:82; Goestira, 2014) who states that KPS by students will increase through direct experience, which is used as a learning experience and is realized when student learning activities are taking place.

The hypothesis of this research is related to learning with the scientific approach model using blended media that produces answers that do not influence. This is happened as the posttest questions used to measure the students' knowledge after learning process in the real object class, ICT class, and blended class is the same. So the questions used cannot be distinguished between questions that can be answered by students learning using real object media, ICT, or blended.

4. Conclusion and Suggestions

4.1 Conclusions

Based on the results of data analysis and discussion, it can be concluded that overall there are differences in the effect of the implementation of the learning model based on the scientific approach using real

object and ICT towards the biological literacy of the urinary system material the eleventh grade of Senior High School students in Yogyakarta.

4.2 Suggestions

Suggestions from the research that has been carried out are as follows. To biology teachers, they are expected to be able to use scientific learning approaches with real objects and ICT on latest material especially when the learning is oriented towards the development of biological literacy that includes science process skills, knowledge, and implementation. The improvement of blended media which is still low needs to be optimized again. Then the aspects of experimentation need to be developed in integrated skills. To other researchers, they are expected to conduct research applying scientific learning approaches with real objects and ICT in other material, so it can provide stronger evidence about the influence of the media on students' biological literacy. The questions used to measure the students' abilities after learning is suggested to be made different between classes.

References

[1] DeBoer, George .E. (2000). Scientific Literacy: Another Look at Its Historical and Contemporary Meaning and Its Relationship to Science Education Reform. Journal of Research in Science Teaching, 37, 582-601. From https://web.nmsu.edu/~susanbro/eced440/docs/scientific_literacy_another_look.pdf

[2] Juhji. (2016). Peningkatan Keterampilan Proses Sains Siswa Melalui Pendekatan Inkuiri Terbimbing. Jurnal Penelitian dan Pembelajaran IPA. Vol. 2, No. 1. Hal. 58-70

[3] Magfirah Rasyid, Andi Asmawati Azis, A. R. S. (2016). Pengembangan Media Pembelajaran Berbasis Multimedia dalam konsep Sistem Indera Pada Siswa Kelas XI SMA. Jurnal Pendidikan Biologi, 7(2), 69–80.

[4] McBride, B. B., Brewer, C. A., Berkowitz, A. R., & Borrie, W. T. (2013). Environmental Literacy, Ecological Literacy, Ecoliteracy: What Do We Mean and How Did We Get Here?. Ecosphere 4(5): 1-20

[5] Munadi, Yudhi. (2013). Media Pembelajaran Sebuah Pendekatan Baru. Jakarta: Referensi (GP Press Group).

[6] Nismalasari, Santiani, dan H.Mukhlis Rohmadi. (2016). Penerapan Model Pembelajaran Learning Cycle Terhadap Keterampilan Proses Sains dan Hasil Belajar Siswa Pada Pokok Bahasan Getaran Harmonis. EduSains vol 4 no 2. 74-94.

[7] Rustaman, Nuryani Y. Soendjojo Dirdjosoemarto, Surosos Adi Yudianto, Yusnani Achmad, Ruchji Subekti, Diana Rochintaniawati, M Nurjhani, (2003). Strategi Belajar Mengajar Biologi. Bandung: Jurusan Pendidikan Biologi FMIPA UPI.

[8] Sadiman, Arif S., Raharjo, Anung Haryono, dan Harjito. (1990). Media Pendidikan, Pengertian, Pengembangan, dan Pemanfaatannya. Jakarta: CV. Rajawali

[9] Suyanto. (2018). Penerapan Model Pembelajaran Berbasis Pendekatan Saintifik dengan Real objects untuk Meningkatkan Proses Sains dan Hasil Belajar. Laporan penelitian. Universitas Negeri Yogyakarta