Effectiveness of Virtual Anatomy System (VAS) Media to Improve Students' Analysis Ability Towards Reproduction System Materials

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ABSTRACT

This research aims to identify effectiveness of virtual anatomy system (VAS) media with inquiry approach in improving students' analysis ability towards reproduction system materials. VAS is a learning media which was developed with a special design resembling a laboratory, equipped with tools and materials, as well as operational procedures in a pratice. The method employed in this research was a quasi - experiment with one group pretest posttest design. The sample consisted of 12 students. The N-gain (0,67) produced belonged to the medium category. The result confirmed that the students' responses using VAS with inquiry approach improved in reproduction system materials. Hence, it can be concluded that VAS media with inquiry approach was highly effective in improving Ivet University students' analysis ability in understanding the reproduction system optimally.

Kata Kunci: Virtual Anatomy System, Inquiry, Analysis Abilty, Reproduction System

INTRODUCTION

Today, education is encouraged to follow the fast advancement of technology and information, emphasizing the need of balance between theories and field activities/practices. Learning sciences can be made more meaningful when active involvement such as observation and laboratory activities are included. One of challenges in teaching reproduction system materials to students is to choose the best way which may improve students' understanding and analysis in solving any conceptual issues. When a concept is fully understood, learning process becomes more meaningful, not a mere remembering activity (Hermansyah et al., 2017).

Students' ability in understanding reproduction system concepts is shaped by their scientific experiences. A scientific experience should not be by the book, but it is a result of gradual analysis development towards itself (Winarni,

2017). A proper approach for improving analysis ability is inquiry. Inquiry allows students to actively search and discover concepts through a systematic learning (Junadi et al., 2016). This approach is useful for learning through experiment or laboratory activities. However, the learning with inquiry approach is not without limitations when applied in laboratory. There are limitations in materials, tools and time. Unsupportive environment could also pose a problem. In Ivet University, reproduction system materials of Natural Sciences (IPA) could not be taught in the laboratory. Because of it, the materials were not taught optimally to students. A similar case was studied in Tuysuz (2010) where during laboratory activities, the teacher had to deal with inadequate tools, expensive materials, time consuming preparation and execution, and intensive supervision, reducing the effectiveness of the process.

To handle such issues, one could use a virtual laboratory in learning. Its operation is much the same as real activities performed in real laboratory. Virtual laboratory may solve the limitations of the laboratories in Ivet University. The selection of reproduction system materials was based on the materials which could not be directly observed by the five senses. This virtual laboratory is one of learning media which optimizes audio-visual dimensions in learning process. A study by Nurrokhmah and Sunarto (2013), employing an inquiry based virtual laboratory, showed positive contribution in students' cognitive aspect during learning solubility in Chemistry class. Another study by Kusdiastuti et al. (2016) showed that the usage of inquiry based virtual laboratory in learning positively influenced students' understanding towards physics concepts. Muhlisin (2017), learning motivation can be influenced from within students and from outside students. Therefore we need media that motivate student enthusiasm for learning. For their study it was recommended the need of better preparation and a different learning model with a wider scale.

Based on the above explanation of previous studies on inquiry and virtual laboratory development, a further development of the virtual laboratory media is needed. This research was aimed to identify the feasibility of such development to improve students' analysis ability in Ivet University.

RESEARCH METHOD

This research employed the quasi-experiment method with one group pretest-posttest design. The pretest was conducted to identify the degree of effect of the inquiry based VAS learning media for improving students' analysis ability. The sample consisted of 12 students.

Tabel 1. Research Design Pattern

Pretest	Treatment	Posttest
O_1	X	O_2

Notes:
O_1:   Initial test before treatment
O_2:   Final test after treatment
X :   Treatment on students with inquiry based VAS media

A written test was employed to identify any improvement in students' analysis ability. After that, their responses were measured by Likert scale. The following formula of gain score was employed to identify the improvement of students' analysis ability before and after the treatment:

$$g = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}} x 100\%$$

Notes:
S_{pre} = score of pretest
S_{post} = score of posttest
Smaks = maximum score

The normalized gain was then interpreted to define the improvement of students' analysis ability based on criteria in the following table:

Treshold	Categories
$g > 0,7$	High
$0,3 \leq g \leq 0,7$	Medium
$g < 0,3$	Low

(Lambertus, 2010:95)

The results of the students' analysis ability improvement before and after treatment were compared.

RESULTS AND DISCUSSION

The feasibility of the virtual anatomy system (VAS) was determined by expert lecturers' assessments on software, materials and visual communication aspects. Students' responses were gathered after they used the VAS media. The improvement of students' analysis ability was determined after comparing the scores of the pretest and the posttest on the usage of the inquiry based VAS learning media.

The results of experts' validation on VAS were analyzed by averaging the scores and deciding the categories they belong to (Mardapi, 2008: 123). The score from the media aspect was 3,84 ("very good") while the score of the validation on the developed material aspect was 3,67 ("very good"). Therefore, the developed media is considered feasible enough to be employed in the learning process using VAS media with inquiry approach.

The students' average score in the pretest was 42,67. This low score was caused by the students' weak analysis ability and undeveloped basic concepts in doing the test. The inquiry based VAS media was then employed in the next learning process. They used VAS animations to conduct experiments with the procedure similar to the real laboratory activities. The usage of VAS in the class boosted the students' curiosity. This was proven by the observation sheets. From the sheets, it was identified that 92% students were enthusiastic in using VAS. Their curiosity were boosted because they employed a new, unfamiliar media. After the treatment, the posttest was conducted and resulted in average score of 81,58. The score implied that the students managed to reach the learning mastery according to the average learning mastery in the reproduction system materials. For a detailed information on the results of the pretest and the posttest, consult the following diagram.
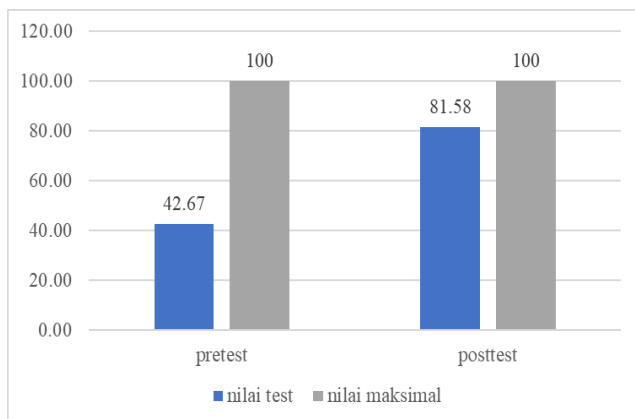

Figure 1. A Diagram of the Scores of Pretest and Posttest on Students' Analysis Ability

Based on the diagram above, it could be concluded that the usage of VAS media could improve students' learning result by 38.91%. The significant change of students' learning result after using inquiry based VAS media was caused by the fact that the learning with VAS media presented information and guided the students in performing the learning simulation better. Each stage performed allowed the students to understand concepts throughoutly, constructing the received scientific knowledge on the reproduction system concepts. The ability to manage information can improve student learning outcomes in understanding the concepts being taught (Nugraheni et al., 2019)

The significant improvement of students' analysis ability was determined by the gain score. The average score of the improvement of students' analysis ability was 0,67 (medium category). The result implied that the learning activity with the newly developed, inquiry based VAS media was effective in improving students' concept analysis ability. On the whole, the learning process with the inquiry based VAS media resulted in a positive, significant change in students' ability in analizing and understanding reproduction materials. This is also supported by Ismail Et al. (2016) research that using STEAM virtual lab can improve students' literacy skills in learning.

During the data collection process, students' responses were collected after using the VAS media. According to Nirwana (2011), the usage of virtual laboratory learning media stimulates students' interest. In line with the study, this research also identified students' interest in the learning process which employed the inquiry based VAS. From the questionnaires which had been answered by the students, the scores of their interest in employing the new media were gained. The average score of them was 86,65% ("very agree"). The score

showed that the learning process which employed the inquiry based VAS media in the learning process was highly accepted and agreeable in the class. The higher students' interests towards an information are, the higher students' ability to remember them will be, positively affecting their achievement of learning results (Yuniarti et al., 2012).

Overall, the learning process with the inquiry based VAS media could improve students' analysis ability on the reproduction system materials. Furthermore, their higher interest and motivation in employing the media improve their learning results. With the media, the students understood the procedure of the practices better. This in turns improves the directiveness and orderliness of the students' scientific work ability.

CONCLUSION

After the implementation of the VAS media with inquiry approach, Ivet University students' ability in analyzing reproduction system material were improved significantly. Therefore, it could be concluded that the VAS media would be effective in the learning of analyzing reproduction system. The improvement of students' analytical skills on the material of the reproductive system is evidenced by an increase of 38.91% in their learning results. It was also supported by the students' positive responses towards the learning with the inquiry based VAS media.

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