USING OF VIRTUAL LABORATORY FOR LEARNING ACTIVITY IN ACID, BASE, AND SALT TOPIC IN SMA NEGERI 1 MANYAR GRESIK

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui hasil belajar siswa dengan menggunakan laboratorium virtual pada materi asam, basa, dan garam. Jenis penelitian ini adalah deskriptif kuantitatif yang menggunakan *pretest and posttest design*, instrumen penelitian ini adalah pretest dan posttest, serta lembar angket respon siswa. Hasil belajar yang dinilai dalam penelitian ini adalah keterampilan berpikir kritis dan penguasaan konsep. Lembar angket respon siswa merupakan lembar yang digunakan untuk mengumpulkan data tentang pendapat dan tanggapan siswa setelah menggunakan laboratorium virtual pada materi asam, basa, dan garam. Penelitian ini dilakukan di kelas XI MIA 1 SMA Negeri 1 Manyar Gresik. Berdasarkan data dan analisis ketuntasan belajar siswa secara klasikal dapat diketahui bahwa hasil posttest siswa pada keterampilan berpikir kritis kategori inferensi sebesar 90% dan kategori kesimpulan sebesar 83,33% dan pada penguasaan konsep sebesar 93,33%. Sehingga dapat dikatakan hasil belajar siswa tuntas secara klasikal. Berdasarkan angket respon siswa bahwa tanggapan siswa terhadap penggunaan laboratorium dalam pembelajaran asam, basa, dan garam cukup positif.

Kata Kunci : *Lab Virtual; Asam, Basa, dan Garam*

ABSTRACT

This research aims to determine student learning outcomes by using a virtual laboratory on the material acid, base, and salt. This research is quantitative descriptive using pretest and posttest design, the instrument of this research is pretest and posttest and student questionnaire responses sheet. Learning outcomes are assessed in this study is the critical thinking skills and mastery of concepts. Student questionnaire responses sheet is the sheet that is used to collect data about students' opinions and feedback after using the virtual laboratory on material acid, base, and salt. This research was conducted in class XI MIA 1 Senior High School (SMA) Negeri 1 Manyar Gresik. Based on data and analysis of student's outcome in the classical thoroughness can be seen that the results of the posttest students in critical thinking skills of inference category as 90% and 83.33% in conclusions category and the mastery of the concept as 93.33%. So it can be said that student learning outcomes classically finished. Based on the student questionnaire responses those students' responses to the use of the laboratory in learning acid, base, and salt is quite positive.

Keywords: *Virtual Lab; Acid, Base, and Salt*

INTRODUCTION

Education plays important role in ensuring the survival of the nation, because education is used to measure the quality of human resources, so that education is the responsibility of the government and the entire people of Indonesia. With the quality of human resources, Indonesia is expected to face all the challenges in the era of globalization. Therefore, it is necessary to change in education as an effort for the future, including improvements in chemistry learning process.

In chemistry learning should provide direct learning experience through the use and development of process skills and scientific attitude [1] Therefore, learning chemistry should not override the discovery process of chemistry concepts. So science skill process is very important to students in order to build chemistry concepts.

According Dahar, practicum can be used as discovery learning. Therefore, in practice can occur discovery learning [2]. By discovery learning the invention will produce some positive impact, of which knowledge can last a long time, more memorable, more easily applied to new situations, and overall will increase students' reasoning. For example, the results of research conducted by Wati, shows that the practical application of learning methods can produce a good mastery concept [3].

In curriculum 2013 that applied in senior high school grade XI there were some material that students are required to conduct laboratory experiments, one of which is a matter of acid, base, and salt. The materials need laboratory practicum to support student's outcome. According Brotosiswoyo in Muflika, practicum is rarely done in practice teaching chemistry in schools. This happens due to various constraints such as, lack of facilities, the cost of which is relatively expensive, limited allocation of instructional time, and difficulty making preparations before the lab [4]. The opinion was strengthened by the results of research by Setyaningtyas in Mumtazah that only 30% of schools that do experiment and the rest do not. To overcome the constraints in practical implementation can be overcome with the use of information and communication technology (ICT), such as computers. With the help of the media in the form of computer students can study in the form of a quasi-experimental chemistry [5].

These problems can be overcome with the use of a virtual laboratory media so that students can perform virtual laboratory. Virtual laboratory is a series of laboratory equipment in the form of software which is operated by computer and can simulate in laboratory activities as if the user is in actual laboratory [6].

This virtual laboratory can also be used to drill critical thinking skills that are reflective thinking that is unreasonable or based on reasoning that is focused on deciding what to believe and what should be done. Indicators of critical thinking skills, namely, providing a simple explanation, build basic skills, concluded, make a further explanation, and set the strategy and tactics [7]. But the critical thinking skills that drill in this study only focused on inference and conclusion.

Inference is an attempt to explain or interpret observations or say what the cause of what has been observed is. At the time of making inferences, be sure to use the correct data and observations. Analyzing all the data collected, and then based on

everything that has been known to be obtained a conclusion about what has been observed [8]. Inference is to identify and ensure the necessary elements to describe the logical conclusion. An example is to predict what will happen next based on what they are doing. After doing inference, it can be concluded.

Hopefully with this virtual laboratory can provide the opportunity for students to do practical work in particular with or without internet access so that students do not need to be present to follow the practice in the laboratory. It becomes effective learning because students can learn on their own without the help of the instructor actively or as teaching assistants who have been there today [9].

Based on the above description, it is necessary to apply a virtual laboratory in learning activities to determine student learning outcomes in the form of critical thinking skills and understanding of the concept of acid, base, and salt and to determine the response of students to use this virtual laboratory media.

RESEARCH METHODS

This study used a pretest - posttest design

$$O_1 \ X \ O_2$$

Figure 1 Design Research

Note :
O$_1$: Pretest Mark
O$_2$: Posttest Mark
X : Treatment of students with learning virtual laboratory

Learning outcomes are known through the pretest and posttest. Pretest used to determine the level of students at the understanding on acids, bases, and salts before learning by using a virtual laboratory, while the posttest used to determine the level of understanding of the students after learning following the use of virtual laboratory.

Student learning outcomes in the form of a pretest given before students get material acid, base, and salt. Students working on the pretest for 15 minutes. Then students are given materials acids, bases, and salts according to the design of learning tools using interactive media virtual laboratory equipped with student worksheets that can be used to drill critical thinking skills. However, critical thinking skills trained in this study is limited to inference and makes conclution. Learning process by using the virtual laboratory is performed for approximately 90 minutes. After that, the students are given posttest for 15 minutes.

Competency achievement of learning outcomes assessed using a scale of 1-4 (multiples of 0.33) was subsequently converted into the title A to D. The results of student learning is said to be completed if the student received grades ≥2,66 or achieve a score of B.

The value of student learning outcomes is calculated using the following formula

$$Values\ obtained = \frac{The\ number\ of\ questions\ answered\ correctly}{Total\ number\ of\ questions}\ x\ 4$$

Student learning result was analyzed using a range of student's outcome:

Table 1 Value of Student's outcome

No.	Value	Predicate
1.	0.00 ≤ Value ≤ 1.00	D
2.	1.00 < Value ≤ 1.33	D+
3.	1.33 < Value ≤ 1.66	C-
4.	1.66 < Value ≤ 2.00	C
5.	2.00 < Value ≤ 2.33	C+
6.	2.33 < Value ≤ 2.66	B-
7.	2.66 < Value ≤ 3.00	B
8.	3.00 < Value ≤ 3.33	B+
9.	3.33 < Value ≤ 3.66	A-
10.	3.66 < Value ≤ 4.00	A

Classically, if the class has been thoroughly studied in the posttest results ≥ 85%, the students in the class achieve mastery of individuals with calculations:

$$Clasical\ thoroughness = \frac{\sum Student\ who\ completeness}{\sum Total\ students}\ x\ 100\ \%$$

In addition to using the instrument pretest and posttest is also used questionnaire student's response that contains written questions that are used to obtain information related to the students' response to the use of media virtual laboratory.

Data results of student responses is analyzed by quantitative descriptive that gives an overview and describes the assessment of the application of media virtual laboratory in accordance with the assessment indicators.

Percentage formula:

$$Percentage = \frac{Total\ score}{Score\ criteria}\ x\ 100\ \%$$

Note:

Total Score	:	The number of scores obtained from the respondents
Score Criteria	:	The highest score for each item multiplied by the number of items times the number of respondents [9]

Table 2 Guttman Scale

Statement	Score
Yes	1
No	0

From the analyze result is obtained the percentage and then the analyze result is inserted into the Likert scale with the following criteria:

Table 3 Interpretation Likert Scale

Percentage (%)	Category
0-20	Not good
21-40	Less Well
41-60	Enough
61-80	Good
81-100	Very Good

The results of the student's response is said to be good if it indicates the category of pretty good to very good [10].

RESULTS AND DISCUSSION

1. Students Learning Outcomes

Students learning outcomes before and after the study are presented in Table 4.

Table 4 Completeness students learning outcomes

No	Learning outcomes		P(%)	
			Pretest	Posttest
1.	Critical Thinking	inference	66,67	90
		Conclusion	46,67	83,33
2.	Mastering Concept		40	93,33

Based on the data in Table 4, the percentage of completeness students learning outcomes for critical thinking in the category inference is 66.67% at pretest and 90% at posttest, while in the category conclusion is 46.67% at pretest and 83.33% at posttest. The percentage of completeness students learning outcomes in mastering concept gets 40% at pretest and 93.33% at posttest.

Student learning outcomes is said to be completed if the student received grades ≥2,66 or achieve a minimum score in the classical class B and is said to be completed when the results of their study on the posttest results of ≥75%. So based on the data in Table 4, the results of student learning can be said to be complete because the classical percentage achieving ≥75%.

Based on the research of Karla W. Kingsley, *"The Effects of Multimedia Software on Achievement of Middle School Students in an American History"* said that the influence of multimedia software to increase students achievement or learning outcomes is significant that an increase in better

performance [11]. It is also in line with Ariani and Haryanto which states that the animation can help the learning process because students can perform cognitive processes more easily if assisted with animation, without animation the cognitive process cannot be done optimally because less motivating students and stimulate cognitive students [12]. Another factor that can affect students' increasing mastery of the concept is the student's attention to what is being studied. In learning by using a virtual laboratory every student has opportunity to operate their own virtual laboratory, so that the students' attention can be focused. This is in accordance with Phing, high student's attention on what is being learned is very helpful and easier for students to learn lessons. So it can be concluded that in the classical student learning outcomes in the material acid, base, and salt is complete [13].

2. Students' Response

Students' response is obtained by giving the questionnaire after the learning process is completed. The aim of giving this questionnaire is to determine students' response to the use of this virtual laboratory. The results of student questionnaire responses are presented in Table 5

Table 5 Results of Student's Response

No.	Aspect	Criteria
1.	Student Interest	100%
2.	The Attractiveness of The Media	80%
3.	The Clarity of Media	90%
4.	Motivating Learning	90%

a) The interest of students

Based on the results of students' response, 100% students express very interested by using the virtual laboratory for practicum. Based on the observation, students seem very enthusiastic doing virtual practicum. It shows that students do not feel bored and tired during the practicum. This is consistent with the fact that learning with computer has own advantages compared with other, using computer makes learning more interesting, fun and not monotonous.

b) The attractiveness of the media

Based on the results of students' response, 80% students express that virtual laboratory is very suitable for practicum. Based on the observations, students' activity indicates that students do practicum and students worksheet with pleasure.

c) The clarity of media

Based on the results of students' response, 90% students express that the virtual laboratory is clear based on the instructions and the language is understood easily.

d) Students' motivation

Based on the results of students' response, 90% students express very interested in a virtual laboratory. This is consistent with the purpose of using virtual laboratory, students will do more learning activities. In addition, Sadiman also said that media education is useful for stimulating students [14].

Based on the results of student's response in Table 5 above, students' response to the using of virtual laboratory for practicum is very well, that is 90% to the category of Very Good.

For students at Senior High School (SMA) 1 Manyar Gresik, learning by using virtual laboratory is something new. The increasing of students' willingness to learn is accordance with the purpose of teaching strategies that is teaching students to learn by themselves [5].

These results are supported by Arsyad who says that teaching using instructional media will attract more attention to motivate students to learn [15].

CLOSING
Conclusion

Based on the research that has been done, it can be concluded that:

1. Classical completeness student learning outcomes using the virtual laboratory can be known from the results of the posttest students in critical thinking skills of inference category as 90% and conclusions category as 83.33% and the mastery of the concept as 93.33%. So, students learning outcome can be said that through classically.

2. The percentage response of students after using virtual laboratory on acid, base, and salt as 100% students express very interested by using the virtual laboratory for practicum, 80% students express that virtual laboratory is very suitable for practicum, 90% students express that the virtual laboratory is clear based on the instructions and the language is understood easily, and 90% students express very interested in a virtual laboratory. So, the virtual laboratory can support learning on acid, base, and salt because virtual laboratory are interactive, dynamic, and not boring.

Advice

Based on the research that has been done, it can be advised that all chemistry learning activities are hoped to train students' critical thinking skills, so further researches on critical thinking skills in other aspects than inference and conclusion are needed.

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