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Analysis of Requirements for Virtual Laboratory Interactive Multimedia for Class X Electrical Conductivity

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Abstract

This study aims to analyze the needs of virtual laboratory interactive multimedia. This analysis is the initial stage of the ADDIE development model. The method used by researchers is descriptive. Researchers will describe the data obtained about the needs of interactive multimedia virtual chemistry laboratories in Bengkulu City High School. At this stage of the analysis, an initial problem analysis was carried out through the results of interviews with class X chemistry teachers and through filling out student needs questionnaires to X MIPA class students at SMA Negeri 4, SMA Negeri 6, SMA Negeri 7 Bengkulu City. The next stage is analyzing the curriculum, materials and students from the results of interviews and filling out questionnaires by students. Based on the results of the research that has been conducted, the researcher can conclude that: (1) students sometimes feel bored with the media used by the teacher; (2) Teachers have not utilized varied media; (3) Teachers and students need interesting media to make it easy to understand chemistry lessons during the learning process; (4) The practicum of electrical conductivity is not able to explain the ionization reaction that occurs; (5) Teachers need a virtual laboratory interactive multimedia on electrical conductivity material as an alternative solution to improve learning outcomes and motivation in the chemistry learning process.

Keywords*: analysis, interactive multimedia, virtual laboratory*

A. Introduction

Education in the era of the industrial revolution 4.0 has great challenges to change including the level of secondary education in it. One of the characteristics of educational change in the era of the industrial revolution 4.0 is in utilizing technology in the teaching and learning process. The blackboard is the main means of choice by teachers in delivering subject matter. Currently, the habit of using this blackboard has begun to shift with the help of technology. The current use of technology that teachers are getting used to is utilizing powerpoints and videos displayed through projectors in front of the class. The utilization of this technology certainly has the hope that students will be more interested and happy when the teaching and learning process takes place.

Based on interviews conducted at three secondary schools in Bengkulu city, namely: SMAN 4, SMAN 6, SMAN 7 Bengkulu city. This interview was conducted to chemistry teachers who teach class X regarding learning in the classroom. The obstacle experienced by the teacher in delivering the material at this time is that the laboratory facilities in the school are used as a study class. This causes teachers to have difficulty doing practicum in the learning process. So that causes teachers to look for other alternatives, namely by using the learning home portal owned by the data center for technology and information for education and culture (PUSDATIN). One of the features used is the virtual laboratory. The use of this virtual laboratory is very helpful for teachers to replace practicum in the learning process. However, this virtual laboratory owned by the learning home port has not been equipped with an explanation of the reactions that occur. Especially in the material of Electrical Conductivity which requires an explanation of the ionization reaction that occurs. This causes student learning outcomes to be not maximized.

Virtual laboratory is a laboratory that can create an interactive environment in experimenting [1]. A chemistry virtual laboratory is a simulation that represents a real laboratory experiment in as similar a form as possible or a computer simulation that allows important functions of a laboratory experiment to be performed on a computer. Or a chemistry virtual laboratory can be said to be a series of computer programs that can visualize abstract phenomena or complicated experiments carried out in real laboratories, so as to increase learning activities to solve problems [2].

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The objectives and advantages of using virtual laboratories are: personalization of learning, which means learning that is personal and specific with consideration of the speed as well as the needs of individual learners. In addition, virtual laboratories have the advantage of overcoming limited resources, so that this virtual laboratory is able to present a complete laboratory with expensive equipment and materials, but at a low cost. The next advantage is complex visualization, with this students are not limited only based on descriptions of words or illustrations from books. Furthermore, the advantages of virtual laboratories are case-based learning, time flexibility, making failure productive, practicum becomes fun through gamification [3].

Development is a field within the scope of educational technology that has benefits in solving problems in learning, based on the analysis that has been done [4]. In developing interactive learning multimedia, there are various development models, one of which is: ADDIE. This ADDIE development model has two important experts, namely Reiser and Molenda [5]. The ADDIE development model is one of the learning system design models that shows the basic stages that are simple and easy to learn, namely the ADDIE model.

Based on relevant research from Sudana [6] regarding the Development of Interactive Maya Laboratory Integrated with LMS Moodle in High School Physics Learning. Cahyaningrum's research, Krisma [7] Development of Interactive Multimedia Virtual Laboratory with Independent Character Strengthening on Science Content of Force Material for 4th Grade Students of SDN Tanggung 1. Azis research. A & Yusuf I [8] Activities and Perceptions of Learners in the Implementation of Lab-Vir on Modern Physics Material in High School. Mulyatun Research [9] Virtual Chemistry Laboratory: An Alternative for Chemistry Learning to Improve Learning Outcomes of Tadris Chemistry Students IAIN Walisongo Semarang.

B. Research Methods

Research method is a scientific step to get data with specific purposes and uses [10]. The research method used is descriptive. Descriptive research is research that is used to determine independent variables, either one or more variables (variables stand-alone) without making comparisons or looking for relationships between variables [11]. This descriptive research was chosen because researchers will describe the data that has been obtained about the needs of interactive multimedia chemistry virtual laboratories in Bengkulu City High School, so that the final results will be concluded. The focus of this research is to study the needs of interactive multimedia virtual laboratories for class X electrical conductivity in Bengkulu City High School. The research time is January 2023. The research subjects were chemistry teachers and students of class X MIPA. The research locations were SMAN 4, SMAN 6, SMAN 7 Bengkulu City. The data collection technique was an interview with the Xth grade chemistry teacher. This was done to get information about the curriculum used in schools, materials suitable for interactive multimedia virtual laboratory and giving some written questions in the form of a questionnaire to X grade students to get information about student characteristics. The questionnaire used is a closed questionnaire with a type of answer scale, namely a Likert scale. Researchers use an odd Likert scale to give respondents a choice so that they respond neutrally. The Likert scale used is five points with five answer options consisting of: Strongly Agree (SS), Agree (S), Disagree (KS), Disagree (TS), Strongly Disagree (STS).

The results of filling out the questionnaire by students were processed using a formula which then obtained the percentage of each question. The percentage is obtained using the Likert scale calculation formula [12].

$$\text{Index Value} = \text{Total Score}/\text{Maximum Score} \quad (1)$$

With:

$$\text{Maximum Score} = \text{Number of respondents} \times \text{Likert Highest Score} \quad (2)$$
$$\text{Total Score} = \text{Total SS} + \text{Total S} + \text{Total KS} + \text{Total TS} + \text{Total STS} \quad (3)$$

Description:

- Total SS = 5 x total respondents voted
- Total S = 4 x total respondents voted
- Total KS = 3 x total respondents voted
- Total TS = 2 x total respondents voted
- Total STS = 1 x total respondents voted

Vol 1 No 2 2022 (36-41)
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From the score interpretation measurement above, the results are based on the following intervals:

Table 1. Assessment Interval

Index	Assessment
Figures 80% – 100%	Strongly Agree (SS)
Figures 60% – 79,99%	Somewhat agree (S)
Figures 40% – 59,99%	Neither agree (KS)
Figures 20% – 39,99%	Somewhat disagree (TS)
Figures 0% – 19,99%	Strongly disagree (STS)

In accordance with this type of research, researchers use the ADDIE development model. The ADDIE model is a systematic model of instructional design with five stages, namely: (1) analysis, (2) design, (3) development, (4) implementation and (5) evaluation [13]. In this study, researchers only conducted the analysis stage which is the first stage of the ADDIE development model, namely analysis consisting of curriculum analysis, material analysis, and student analysis.

C. Results and Discussion

The purpose of this study was to analyze the needs of virtual laboratory interactive multimedia needs for class X electrical conductivity in Bengkulu City High School in accordance with curriculum analysis, material analysis and learner analysis.

1. Curriculum Analysis

This curriculum analysis is obtained through interviews with class X chemistry teachers to find out the curriculum used by the school. This curriculum analysis is needed to be a reference in making media. The researcher obtained the analysis of the curriculum used in the three schools (SMAN 4, SMAN 6, SMAN 7 Bengkulu City) which is the 2013 curriculum.

Curriculum 2013 is a competency-based curriculum as well as character-based as a refinement of the previous curriculum [14]. The implementation of the 2013 curriculum is expected to produce productive, creative and innovative people [15]. In class X chemistry lessons for this 2013 curriculum has basic competencies 3.8 analyze the properties of solutions based on their electrical conductivity, and 4.8 distinguish the electrical conductivity of various solutions through the design and implementation of experiments.

2. Material Analysis

Furthermore, after conducting a curriculum analysis, researchers analyze the material that is in accordance with the problems faced so that it can be effectively used in the learning process. Through interviews with class X chemistry teachers regarding the difficulties experienced in understanding chemistry subject matter during learning. There are problems that arise, namely chemistry learning has obstacles, namely visualization or depiction of ion reactions during practicum on electrical conductivity material. So far, the teacher has used the media owned by the learning home portal, namely the virtual laboratory. It's just that the virtual laboratory on the learning home portal is not yet equipped with teaching materials and visualization or depiction of ion reactions that occur. From these problems, researchers are interested in developing an interactive multimedia virtual laboratory that can be used in the learning process with the visualization of ion reactions that occur.

3. Student Analysis

This student analysis aims to determine student characteristics and learning characteristics. This is done so that the learning process can run properly. Based on the results of the questionnaire that has been given to class X students at SMA (SMAN 4, SMAN 6, SMAN 7) in Bengkulu City. The questionnaires were administered directly on January 17 to 19, 2023, with a total of 105 respondents. The results of filling out the questionnaire can be seen as follows:

Table 2. Respondent Questionnaire Results

No	Statement List	Likert Scale					Total Score	Index	Decision
		SS	S	KS	TS	STS			

Vol 1 No 2 2022 (36-41)
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FINGER
Jurnal Ilmiah Teknologi Pendidikan

1	I like chemistry lessons	5	48	45	136	9	243	46%	KS
2	I easily understand chemistry lessons delivered by the teacher	5	76	93	96	6	276	53%	KS
3	I am used to using gadgets (laptop, pc, or handphone)	155	240	42	0	0	437	83%	SS
4	I enjoy learning chemistry using gadgets (laptop, pc, or handphone)	165	212	54	2	0	433	82%	SS
5	I sometimes get bored with the learning media used by the teacher	45	136	96	54	3	334	64%	S
6	I want teachers to use varied learning media	260	188	18	0	0	466	89%	SS
7	I am happy when learning there are pictures that can explain the learning material	285	164	21	0	0	470	90%	SS
8	I am happy when learning there is a learning video so that it is easier to understand	255	164	36	2	0	457	87%	SS
9	I am happy when learning there are learning animations so that it is easy to understand abstract material concepts	235	188	30	2	0	455	87%	SS
10	I am happy that when learning there is a practicum simulation that makes it practical in learning activities	220	220	18	0	0	458	87%	SS
11	I am interested if learning chemistry using interactive multimedia virtual laboratory	190	232	24	2	0	448	85%	SS
12	I think learning chemistry using interactive multimedia virtual laboratories can increase my motivation to learn	190	212	39	0	1	442	84%	SS
13	Chemistry subjects are difficult to understand if explained only in theory	115	244	60	2	0	421	80%	SS
14	Chemistry is a subject that is difficult to understand	65	180	132	4	1	382	73%	S
15	When explaining chemistry subjects the teacher uses media	50	288	54	8	1	401	76%	S
16	Teachers never present interesting learning media in the learning process	30	140	150	26	1	347	66%	S
17	The teacher explains the material using the LCD provided by the school	45	144	60	64	8	321	61%	S
18	I own a device (laptop, PC, or handphone)	165	248	27	2	0	442	84%	SS
19	I always bring gadgets (laptop, pc, or handphone) to school	200	236	18	0	0	454	86%	SS
20	I think learning chemistry using interactive multimedia virtual laboratories will be more interesting in class	275	172	21	0	0	468	89%	SS

Vol 1 No 2 2022 (36-41)
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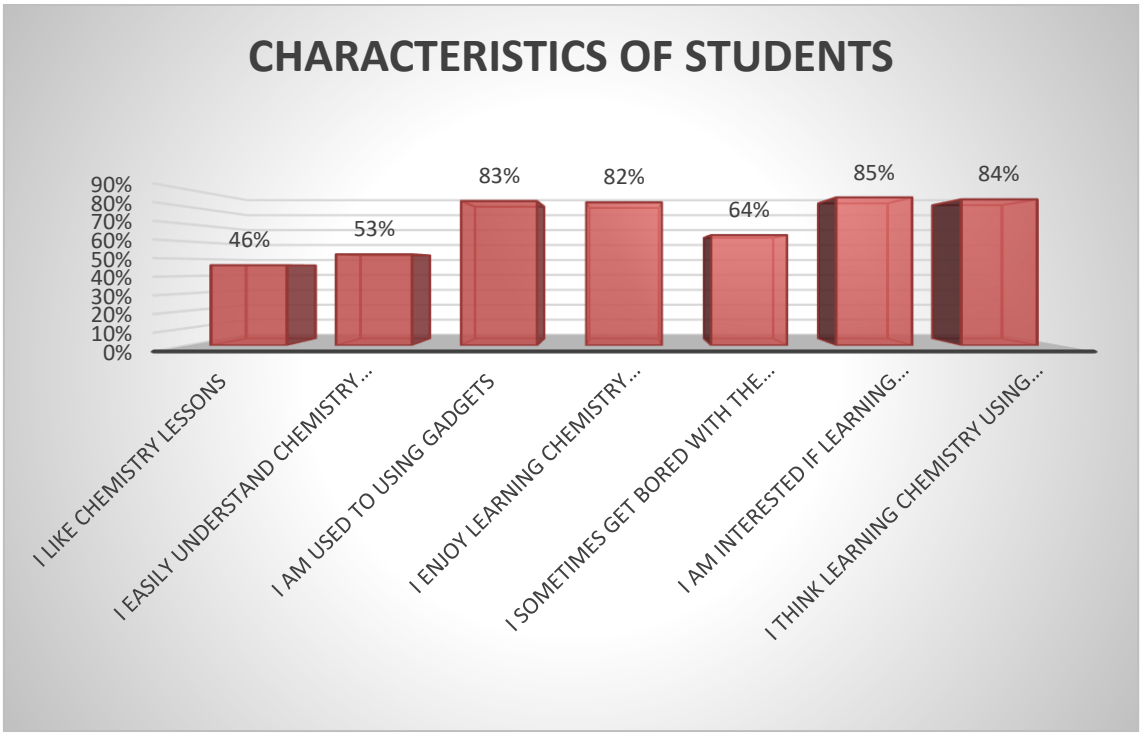

Figure 1. Student Characteristics

Analysis of student characteristics can be seen from table 2 of the respondents' results from item numbers 1 to 12. Some of the problems seen are that students do not like chemistry lessons and sometimes students feel bored with the media used by the teacher. And also lack of understanding of chemistry lessons delivered by the teacher. And students want teachers to use more varied media. Based on the results of respondents about the characteristics of students, it is found that students are accustomed to and enjoy using devices to study chemistry, and students strongly agree that learning chemistry using virtual laboratory interactive multimedia will be more interesting in class. This is illustrated in graph 1. Student characteristics.

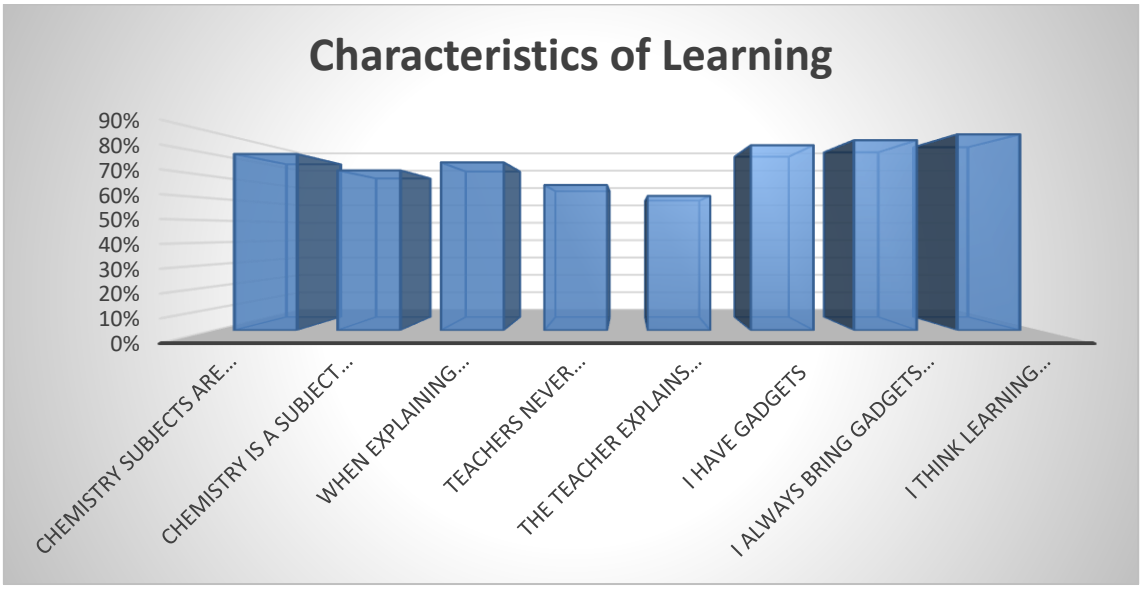

Figure 2. Learning Characteristics

Analysis of learning characteristics can be seen in items number 13 to 20 in table 2 and graph 2 learning characteristics. The results of the respondents obtained several problems, namely students find it difficult to understand chemistry lessons if explained only in theory, so students feel that chemistry lessons are difficult to understand. The results of these respondents can also be seen if students have gadgets and always

bring gadgets to school, and students think that learning chemistry using virtual laboratory interactive multimedia will be more interesting in class.

D. Conclusion

The results of the research that has been done show that: (1) students sometimes feel bored with the media used by the teacher; (2) Teachers have not utilized varied media; (3) Teachers and students need interesting media to make it easy to understand chemistry lessons during the learning process; (4) The practicum of electrical conductivity is not able to explain the ionization reaction that occurs; (5) Teachers need a virtual laboratory interactive multimedia on electrical conductivity material as an alternative solution to improve learning outcomes and motivation in the chemistry learning process.

References

[1] R. R. Meyer and Y. Hendrian, "Aplikasi Chemical Virtual Lab dengan Menggunakan Bahasa pemrograman Java serta Mengimplementasi JavaFX," *Infortech*, vol. 2, no. 1, pp. 60-61, 2020.

[2] A. Swandi, S. N. Hidayah and L. J. Irsan, "Pengembangan Media Pembelajaran Laboratorium Virtual untuk Mengatasi Miskonsepsi pada Materi Fisika Inti di SMAN 1 Binamu, Jeneponto," *Fisika Indonesia*, vol. XVIII, no. April, p. 52, 2014.

[3] W. Wibawanto, Laboratorium Virtual Konsep dan Pengembangan Simulasi Fisika, Semarang: LPPM UNNES, 2020.

[4] N. Suryani, A. Setiawan and A. Putria, Media Pembelajaran Inovatif dan Pengembangannya, Bandung: Remaja Rosdakarya, 2018.

[5] F. Hidayat, "Model ADDIE dalam Pembelajaran Pendidikan Agama Islam," *Inovasi Pendidikan Agama Islam*, vol. 1, no. 1, p. 30, 2021.

[6] I. N. M. Sudana, Pengembangan Lab Maya Interaktif Terintegrasi LMS Moodle pada Pembelajaran Fisika SMA, Bali: Universitas Pendidikan Ganesha, 2022.

[7] K. Cahyaningrum, Pengembangan Multimedia Interaktif Virtual Lab-Vir pada Materi Fisika Modern di SMA, Malang: Diploma Thesis, Universitas Negeri Malang, 2013.

[8] A. Azis and I. Yusuf, "Aktivitas dan Persepsi Peserta Didik dalam Implementasi Lab-Vir pada Materi Fisika Modern di SMA," *Fisika Indonesia*, vol. 5, no. 2, pp. 37-42, 2013.

[9] Mulyatun, "Laboratorium Kimia Virtual: Alternatif Pembelajaran Kimia untuk meningkatkan Hasil belajar Mahasiswa Tadris Kimia IAIN Walisongso," *Inovasi Pendidikan Kimia*, vol. 7, no. 1, p. 1031, 2013.

[10] Sugiyono, Metode Penelitian Kuantitatif, Kualitatif, Bandung: Alfabeta, 2018.

[11] Sugiyono, Metode Penelitian Kombinasi (Mix Methods), Bandung: Alfabeta, 2015.

[12] Sugiyono, Metode Penelitian Pendidikan (pendekatan Kuantitatif, Kualitatif dan R&D), Bandung: Alfabeta, 2017.

[13] S. C. Wibawa, R. Harimurti, Y. Anistysari and M. S. Sumbawati, "The Design and Implementation of An Educational Multimedia Interactive Operatiom System Using Lectora Inspire," *ELINVO (Electromics, Informatics, and Vocational Education)*, vol. 2, no. 1, pp. 74-79, 2017.

[14] Mulyasa, Implementasi Kurikulum 2013, Rawamangun: PT. Bumi Aksara, 2018.

[15] Mulyasa, Pengembangan dan Implementasi Kurikulum 2013, Bandung: PT Remaja Rosdakarya, 2013.

[16] B. A. Pribadi, Model Desain Sistem pembelajaran, Jakarta: Dian Rakyat, 2009.