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Development of Schoology-based E-Learning on Ion Equilibrium and pH of The Buffer Solutions

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ABSTRACT

This study aims to develop a Schoology-based e-learning media and to find out the validity and response of users (teachers and students). The method used in this research was Research and Development (R&D) with the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model. The implementation stage was not carried out due to the limitations of the research. Validation tests carried out by material and media experts as well as limited trials on students and teachers were obtained using a questionnaire. The data analysis technique used was descriptive analysis. The validation results from material and media expert showed the percentage of 93.23% and 90.69% in the valid category. The results of trial by student and teacher responses showed the percentage of 94.40% and 93.12% in good category. The Schoology-based e-learning media on ion equilibrium and buffer solutions is valid and suitable for use in online learning.

Keywords: buffer solutions, e-Learning, ion equilibrium, schoology

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1. Introduction

Learning is the most crucial activity in the entire educational process in schools. Achieving educational goals in schools depends on how learners experience the learning process. During the learning process, the teacher acts as a facilitator, motivator, and guide to advance learners in accomplishing learning goals (Slameto, 2010).

In the 21st century, learners must keep up with information and communication technology (ICT). The existence of web-based learning is one of the proofs of technological advances in education. Web-based learning is a learning activity that utilizes websites accessed through the internet.

In the field of education, ICT can be utilized by using computer-based interactive learning media. The computer can solve problems that are impossible to present in the classroom with conventional learning media through simulation techniques. In addition, the computer can reconstruct abstract issues found in many chemistry materials in schools (Putri & Ardi, 2021).

Chemistry is one of the subjects studied in senior high school. Studying chemistry requires skills and thinking to understand,

discover, develop concepts, theories and laws, and problem-solving in daily life. One of them is on the ion equilibrium and pH Buffer Solution materials studied in 11th grade Senior High School. Buffer solution material requires an explanation in material visualization and understanding of concepts and application of formulas. A fun and exciting learning atmosphere and learning media are needed (Alighiri et al., 2018).

The COVID-19 pandemic currently engulfing Indonesia constrains the government to start quickly and responsively to encourage its citizens to implement social distancing or isolate themselves at home in anticipation of the spread of the increasingly widespread virus. One of the affected aspects in Indonesia is the education sector. Activities involving people now became limited, such as attending school, worshiping, working, etc. The online learning process is applied to organize safe learning activities. Online learning utilizes the internet network that can reduce direct interaction to minimize the spread of the coronavirus (Nabila, 2020).

Since cases of the COVID-19 virus began to increase, schools and colleges are no longer carrying out activities as usual because the government imposes a learning system from home. One of the proper steps in this pandemic situation is to utilize network and information technology for the development of learning systems in schools or colleges using Online Learning Model (OLM) or Electronic Learning (e-Learning) in schools or colleges (Nabila, 2020).

To implement e-Learning, an application called Learning Management System (LMS) is needed. LMS is an application used to manage online learning that comprises several aspects, which are materials, placement, management, and assessment. Several types of LMS can be utilized in the learning process, one of which is Schoology (Mahnegar, 2012).

Schoology is an LMS for schools that offers classroom-like learning and is as easy to use as Facebook. Pages on Schoology that can be used include attendance records, facilities to manage grades, tests, quizzes, and homework (Firmansyah, 2015). Through Schoology, students can learn by using video tutorials and documents uploaded by teachers as a deepening of the material and also by holding online discussions (Purwitasari et al., 2019).

Schoology-based learning media provides an advantage in the online learning process because it does not require hosting, so it can be accessed for free through the internet (Susilowati & Wicaksono, 2019). Through online learning using Schoology media is able to generate student activity and liveliness (Misbah et al., 2018); as a facilitator, the teacher becomes more maximal (Salim et al., 2020); and ease of use and manufacture (Haryanto, 2018). In line with Nazarenko (2015) research, 60% of students reportedly prefer learning by utilizing ICT because it makes it easier to access subject matter and improve ICT skills.

The development of learning media with Schoology has been widely done. Faizah (2016) states that the learning media developed with Schoology is on valid and practical criteria so that it is known that Schoology is suitable for use. The same is also stated by Aminoto (2014) that Schoology learning media can increase student activity. Schoology's practicality is in the aspects and criteria that have been fully implemented (Sapriani et al., 2019). However, the development of e-learning media was still minimal (Mariezki et al., 2021).

Therefore, the problem formulations in this study are how to develop Schoology-based e-Learning media on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School. The product developed is valid based on aspects of content substance, learning design, usability, functionality, visual communication, and how users (teachers and students) respond to the product developed. Thus, the research aims to produce a valid Schoology-based e-Learning media on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School. This is based on content substance, learning design, usability, functionality, and visual communication and reviews user responses to the products developed.

2. Research Method

The research was conducted in 2020 with the stage of product development in the Chemical Education Study Program, Mathematics and Science Education (PMIPA), Teacher Training and Education Faculty (FKIP), Riau University, and trial stage at Muhammadiyah 1 Pekanbaru Senior High School and MAN 2 Kampar. The research method used was the research and development (R&D) method that produces a product in the form of a learning media and then tests the effectiveness. The R&D model used was the development of ADDIE, which consists of five stages, which are, analysis, design, development, implementation, and evaluation (Sugiyono, 2015).

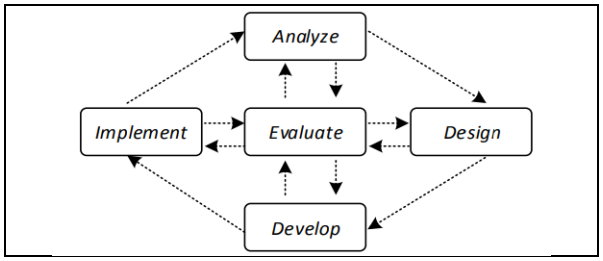

Figure 1. ADDIE Development Model Stages
(Sugihartini & Yudiana, 2018)

The research instruments used were validation sheet questionnaires by material and media experts equipped with validation rubrics and user (teacher and student) response questionnaire sheets. Through research instruments, validation and user responses data were obtained, which was then analyzed using descriptive analysis techniques.

Validation was done by two material experts and two media experts. A limited trial test was conducted on three students and the teacher's response was carried out to 3 high school chemistry teachers. The entire research instrument is in a Likert scale with a score of 1 to 4 (Sugiyono, 2015).

Tabel 1. Likert Scale Category

Scale	Explanation
1	Strongly Agree
2	Agree
3	Disagree
4	Strongly Disagree

(Sugiyono, 2015)

Through the recapitulation of the data, then calculated the average of percentage using formula (Riduwan, 2012):

$$P = \frac{\sum}{\sum Xi} \times 100\%$$

The meaning of Schoology-based e-Learning media quality on Ion Equilibrium and pH Buffer Solution in 11th grade Senior High School was done by converting the average of percentage obtained by spesific criteria (Riduwan, 2012).

Tabel 2. The Meaning Criteria

Percentage (%)	Explanation
80.00-100	Good/Valid/Proper Sufficiently
60.00-79.99	Good/Sufficiently Valid/Sufficiently Proper
50.00-59.99	Deficient /Less Valid/Less Proper
0-49.99	Not Good /Not Valid/Not Proper

(Riduwan, 2012)

3. Result and Discussions

Research conducted produced Schoology-based e-Learning media on Ion Equilibrium and pH Buffer Solution in 11th grade Senior High School. This product can be accessed using computers, laptops, notebooks, and gadgets with Android and iOS operating systems.

The research stages began with analysis, design, development, and evaluation at each previous stage. The implementation stage was not conducted because the research cannot produce a valid Schoology-based learning media. Researchers did not measure the effectiveness of learning media that should be obtained from the implementation stage. The analysis results divided the Ion Equilibrium and pH Buffer Solution materials into four sub-materials at four meetings: properties of buffer solutions, types of buffer solutions, calculating pH buffer solutions and determining the benefits of buffer solution in life. The design obtained a Schoology-based e-Learning media blueprint on Ion Equilibrium and pH Buffer Solution materials which refers to systematic material stacking according to the chemistry syllabus of 11th grade Senior High School 2013 Curriculum and research instruments.

Schoology-based e-learning media development results on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School validated by two material experts and two media experts are on valid criteria with consecutive percentages being 93.23% and 90.69%. Material experts' validation focused on the substance aspects of content and learning design, whereas validation by media experts focused on aspects of usability, functionally, and visual communication. These three aspects can describe learning media with specific abilities and uses to provide material understanding (Pamungkas, 2018).

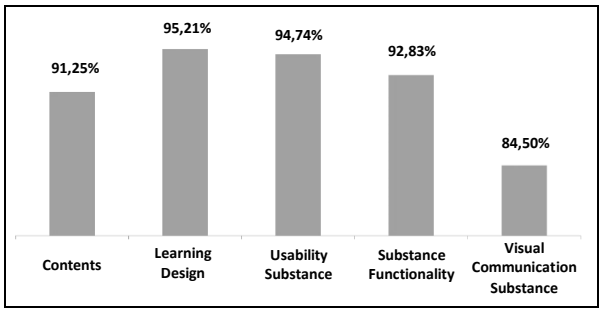

Figure 2. Validation Result Diagram

The display of Schoology-based e-Learning media on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School that was revised and declared valid is presented in Figure 3.

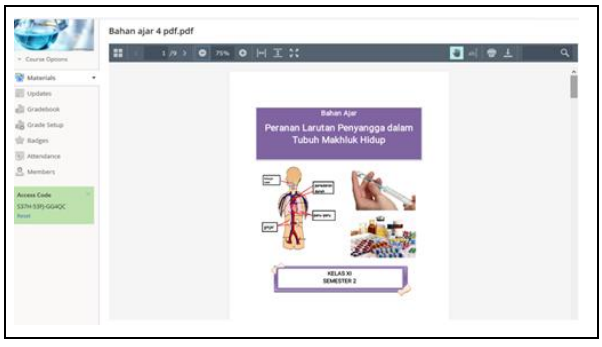

Figure 3. Development Product Display

Schoology-based e-Learning media on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School consists of several main menus, such as 1) Front Page (Login and Sign In Page), 2) Home, and 3) Teaching Materials Folder (Stimulus, Teaching Materials, student worksheet, and Evaluation). The stimulus menu contains a video that can stimulate students to ask questions related to teaching materials that will be discussed on the student worksheet. The menu of teaching materials provides some materials related to Ion Equilibrium and pH Buffer Solution and a concept map that describes the whole and interrelationships between teaching materials. Evaluation is presented in the form of essays to construct the results of their thinking with their language.

Once declared valid, Schoology-based e-Learning media on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School was a limited trial test to three learners and three Senior High School chemistry teachers to determine the user response. Respondents were students of 12th grade Natural Science Senior High School who have studied Ion Equilibrium and pH Buffer Solution materials.

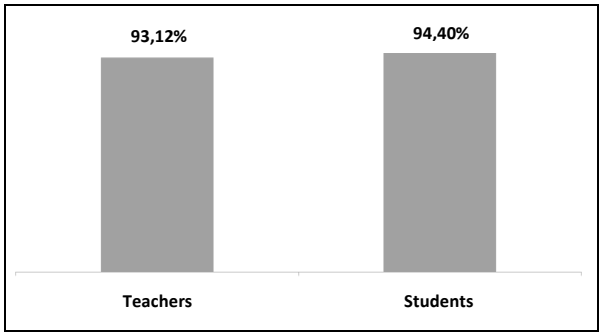

Figure 4. Diagram of Trial and Response Results

4. Conclusion

Schoology-based e-Learning media development products on Ion Equilibrium and pH Buffer Solution materials in 11th grade Senior High School were developed using the R&D method with the ADDIE development model. Valid products resulted in the validity percentage of aspects of content substance (91.25%), learning design (95.21%), usability substance (94.74%), functionality substance (92.83%), and visual communication substance (84.5%), and overall (91.70%). Products are also considered good to be used in the learning process according to the results of the limited trial test and user responses (teachers and learners) with percentages of 93.12% and 94.4%, respectively.

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