The Development of Schoology as Media to Supporting Blended Learning on Stoichiometry Topic

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Abstract. This study aims to develop Schoology media as a support for Blended Learning on the subject of Stoichiometry. This research used a Research and Development (R&D) design with the Plomp model. The Plomp models have four steps faces (investigation, Design, construction and validation). The data was collected used an instruments in the form of validation sheets given to four validators and response sheets to two chemistry subject teachers and 20 students in Senior High school. The data was analyzed by calculating the percentage of the validation score and the user's response. The results obtained that the Schoology learning media are valid with an average score 93.98%, while, the teachers responded when they used the media learning was very good with the percentage of response scores 94.32% and the average student response score of 85.15 %. Based on the results of the study, it can be concluded that the Schoology media as a support for Blended Learning on the subject of developed stoichiometry is declared valid.

1. Introduction
21st century led us to a world that is no longer bound by time and place. Everything becomes limitless due to the influence of the development of the internet and digital technology. 21st century learning has also made technology the basis of human life. Daryanto [1] stated that the 21st century learning paradigm emphasizes the ability of students to think critically, be able to connect knowledge with the real world, master information technology, communication, and collaboration. The ways to achieve the ability to master technology, information, communication, and collaboration is teacher or students have to utilize e-learning media in the class with online learning. Talizaro [2] states that the role of instructional media in the teaching and learning process is an integral part that could not be separated from education.

The subjects that students learn in senior high school level is chemistry, one of the topic was about stoichiometry, this topic requires students to understand an abstract concepts, learning the basics of chemical calculations, and becoming the basis for further chemistry topics, thus requiring students to understand concepts and be skilled in calculations. Based on interviews with chemistry teachers in Pekanbaru, it was obtained a description of the problem regarding the ineffective time allocation because the effective week was disrupted by other class examinations. The teacher has made an effort for students by giving reading assignments and gives homework. The material left behind is explained at the next meeting which is followed by an explanation of the material at the meeting concerned.

Furthermore, based on the investigation teacher does not provide a media that helps students to understand the topic. This makes learning seem boring, learning concepts are not mastered, and learning becomes less interesting. 64% of students find it difficult to understand stoichiometric topic for different reasons, including too many calculations and the material is not all explained,
explanations from the teacher are difficult to understand, and insufficient learning time during the teaching and learning process.

The interviews were also conducted with chemistry teachers who teach chemistry in high school. Information was obtained that learning was carried out in the classroom through group discussions and presentations without using learning media, such as e-learning media; therefore, students make extra effort to understand abstract topics. Based on this explanation, a learning media is needed that can be implemented in the class and online learning (blended learning). According to Deklara [3], Blended learning becomes an attraction in the 21st century learning because it is in accordance with the development of information and communication technology. Safura [4] states that Blended learning aims to combine the nature for interaction online with traditional place-based classroom methods.

Blended learning can be supported using Schoology media. Muh Yusuf Hidayat [5] stated that Schoology is a school-based social network media that combines a Learning Management System (LMS) and social networking. The appearance of Schoology is almost the same as the social network as Facebook. Through Schoology, learning is very easy and can provide effective learning processes. Media Schoology is expected to attract the attention of students as a new learning media. Beni Hari Firmansyah [6] states that Schoology-based Blended learning can increase effectiveness and flexibility in learning and improve the quality of education in the fields of science, technology, and communication which are the main goals in education development.

2. Methodology

This research was carried out in the Chemistry Education Study Program of Riau University Pekanbaru with trials at senior high school in Pekanbaru. Schoology media development as a support for Blended learning that was designed as a Research and Development with the Plomp model. According to Sugiyono [7], R&D is defined as a process or steps to develop new products and test the effectiveness of these products or improve existing products that can be accounted for and further they can be used in the wider community. According to Rochmad [8] the Plomp model is a development model consisting of the preliminary investigation stage, the design phase, the realization/construction phase, the validation phase, the testing and revision stages (evaluation, test, etc.) and revision) and the implementation stage (implementation). This can be seen in Figure 1.

The instruments were used a validation sheets and user response sheets. Validation sheets are used to obtain information about the validity of instructional media. The information obtained through this validation sheet can be used as material for consideration in revising Schoology media to support Blended Learning. This media is validated by validators and media validators through assessments based on aspects of content substance, learning design, usability, functionality, and appearance (visual communication). User response questionnaires are used to collect user response data (teachers and students) to learning media at SMAN 1 Ujungabtu and SMAN 8 Pekanbaru.

Data collection techniques used a literature study and field studies. Literature study is carried out to obtain relevant theoretical information, while field studies are conducted to obtain data related to validity and user responses.

The data analysis technique used descriptive statistical analysis. The validation aspects assessed by the validator that was made in the form of a rating scale using (Likert scale) with a score of 1-4 (not valid to valid). The Likert scale provides flexibility to the validator in assessing learning devices. The validity analysis is based on the score taken from the validator for each aspect of the assessment. The results obtained are converted into qualitative values based on the assessment criteria. Analysis of user responses (teachers and students) is determined based on the percentage of positive statement alternative scores using the following formula:

\[ R = \frac{f}{n} \times 100\% \]  

(1)

The results obtained are converted into qualitative values according to the assessment criteria of the attitude measurement scale with a score of 1-4.
Figure 1. Schoology development flow as a support for Blended Learning with the Plomp development model.
3. Results and Discussion

The development research that has been carried out has resulted in a product in the form of Schoology learning media as a support for Blended Learning on the subject of stoichiometry. Products in the form of Schoology learning media can be accessed using electronic devices such as computers, laptops, notebooks, and various gadgets with the Android and iOS operating systems and other technologies. Schoology learning media products are made and designed by researchers with the aim that they can be used as learning resources for students in class and outside the classroom.

The procedure in developing Schoology learning media as a support for Blended Learning on the topic of stoichiometry is based on the Research and Development (R&D) method with the Plomp development model. The following is an explanation of the results of research at each stage of the development of Schoology learning media.

3.1. Initial Investigation Phase

The initial investigation phase consists of several stages, firstly, front end analysis, student analysis, competency analysis and material analysis. The results of the front end analysis are less effective time allocation because the effective week is disrupted by examinations time, students difficult to understand stoichiometric material only by studying in school because stoichiometric material requires understanding of concepts and skilled calculations as the basic concept for the next subject of chemistry, and the lack of learning resources that are able to generate interest and motivation of students. The learning resources used so far is textbooks, LKPD, and the media that teachers used such as a PPT.

The results of the analysis show that the students generally have an age range of 15-16 years. According to Sitti Aisyah Mu'min [9] based on Piaget's cognitive development theory, students are at the formal operational stage and approaching the maximum intellectual level. At this stage, students can be trained to learn independently. Students are also required to learn in accordance with current learning developments in 21st century learning.

The results of the competency analysis have been carried out according to the syllabus of chemistry in high school level by the Ministry of Education and Culture (2017). This analysis shows that the stoichiometric material is found in the basic competencies of 3.10 and 4.10 Class X. Analysis of stoichiometric material was carried out to examine the concepts of stoichiometric material were systematically arranged according to the high school chemistry syllabus by the Ministry of Education and Culture (2017) where consisting of 5 meetings.

3.2. Design Phase

In this phase produces a prototype design and instrument. The result of designing the prototype is the initial design of the Schoology media as a support for Blended Learning on the subject of stoichiometry where equivalent. The results of the design of the assessment instrument are in the form of a material expert validation sheet grid and a media expert. The grid of the media expert validation sheet refers to instrument by Baiq [10] which is customized that have required of Schoology media assessment and the material expert assessment instrument refers to the Guide to Developing ICT-Based Teaching Materials by the Ministry of National Education, Directorate of Senior High School Development (2010) [11] adapted that required of Schoology's media assessment. The results of the design of the assessment instrument are also in the form of a user response questionnaire design (teachers and students) to determine user responses and learning media that have been developed with reference to previous research.

3.3. Realization/Construction Phase

This phase is the realization of the results of designing a prototype in the form of Schoology learning media as a support for Blended Learning on the subject of stoichiometry. The composition of the Schoology media on the subject of stoichiometry is in accordance with the prototype design which contains content in the form of identity filling, homepage, stoichiometric classes and sub-subjects. Each sub-subject consists of teaching materials, stimulus, LKPD, and evaluation. Media comes with
videos and pictures. The realization of the design results of the assessment instrument in the form of validation sheets and user response questionnaires (teachers and students) along with a rubric.

3.4. Validation, Pilot Study, and Revision Phase
The validation, pilot study and revision phases have been carried out in order to obtain results in the form of comments and suggestions, and then a final assessment of the prototype has been made. The following is a description of the results of each of these activities.

3.4.1. Validation. Validation of learning media was carried out by 4 validators, 2 material validators and 2 media validators. The assessment by the material validator was focused on the substance aspects of the content and the aspects of the learning design, while the assessment by the media validators focused on the substance aspects of usability, the substance aspects of functionality, and the aspects of appearance (visual communication).

Suggestions and improvements obtained during validation are used as a reference for revision to get better learning media. Overall, the validation results showed validity criteria with an average validation score of 93.98%. The percentage is in the percentage range of 75.00-100% with valid criteria. The results of the assessment of each aspect can be seen in Table 1 and the recapitulation diagram of the average score of the five aspects of the validation of learning media can be seen in Figure 2.

Table 1. Overall Results of the Material and Media Validator Validation

| No | Aspect                        | Score percentages (%) |
|----|-------------------------------|-----------------------|
| 1  | Substance Content             | 90.625                |
| 2  | Learning Design               | 93.750                |
| 3  | Substance Usability           | 91.075                |
| 4  | Substance Functionality       | 100.000               |
| 5  | The Substance of Visual Communication | 94.450            |
|    | Average (%)                  | 93.98                 |

Validity Criteria for Average Overall Aspects: Valid

Figure 2. The results of the Schoology media analysis that have been developed in the aspect of media validation

3.4.2. Pilot Study. The test was conducted to obtain comments, suggestions, and assessments from the user side of Schoology media as a support for Blended Learning on the stoichiometry using a user response questionnaire. Overall, the percentage of the test score for the response of teacher users to Schoology media as a support for Blended Learning learning, the subject of stoichiometry is 94.32% with very good criteria and students' scores are 85.15% with very good criteria. Students are interested
in using Schoology media in learning because it makes learning easy both in class and online wherever and whenever. Schoology learning media has complete features accompanied by supporting pictures and videos.

3.4.3. Revision. The results of the pilot study obtained comments, suggestions and improvements from teachers and students towards learning media. The revised results of the Schoology media trial were not retried because overall the trial results obtained a positive response from both teachers and students. This can be seen from the percentage of the overall score which is included in the very good criteria. After making revisions, a valid learning media is obtained.

4. Conclusion
Based on the research results, it can be concluded that the development of Schoology media as a support for Blended Learning learning, the subject of stoichiometry for high school is declared valid. The results of the validation of Schoology learning media obtained for the content aspect are 90.625%, the learning design aspect is 93.750%, the usability aspect is 91.075%, the functionality aspect is 100%, and the display aspect (visual communication) is 94.450%. While the pilot study for teachers and students obtained very good criteria with an average of 94.32% by the teacher and 85.15% by students.

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