

Development of a E-Student Worksheet Based on Phenomenon Based Learning (PhenoBL) on Reaction Rate Material Using the Wizer.me Website For Class XI High School/MA

ABSTRACT

The aim of this research is to develop an E-Student Worksheet based on Phenomenon-Based Learning (PhenoBL) on Reaction Rate Material Using the Wizer.me website for Class XI High School/MA. This development research uses the 4-D model, which consists of define, design, develop, and disseminate, but this research was only carried out only up to the development stage. Data was collected through questionnaires, and interviews. Data analysis was carried out quantitatively, and qualitatively, guided by ideal evaluation criteria to determine the quality of the E-student worksheet. The research results show that the E-Student Worksheet based on Phenomenon-Based Learning (PhenoBL) on Reaction Rate Material Using the Wizer.me Website For Class XI High School/MA that has been developed were declared valid in material validation in terms of content eligibility, characteristics of Phenomenon-Based Learning (PhenoBL), language, presentation and graphics were 97.5%, 100%, 95%, 100% and 100% respectively. The results of media validation in terms of E-Student Worksheet display and software usage are 100% and 100%. The results of the user response test obtained a percentage score of 92.41% by chemistry teachers with very good criteria and 89.51% by students with very good criteria, which indicates that this E-student worksheet is valid and suitable for use as an alternative teaching material in the learning process, and it is hoped that this research can be continued in the next stage.

Keywords: Reaction Rate, E-Student Worksheet, Phenomenon Based Learning

1. INTRODUCTION

The swift advancement of technology in today's global landscape has become deeply intertwined with the education sector. As global demands evolve, the educational system must continuously adapt to these technological changes in order to enhance the quality of education. This necessitates specific adjustments, particularly in the integration of information and communication technology into the learning process [1]. In order for learning to keep up with technological developments and students to be able to compete in a globalized world, it is expected to be able to use equipment digitally. The benefits of digital learning in supporting the implementation of the learning process are to increase students' absorption in understanding the context of learning materials, to promote independent learning skills, to increase students' active participation, and to increase the ability to present information using technological devices to develop learning skills [2].

An effort to improve the quality of education today is the Independent Curriculum [3]. The independent curriculum is a new policy made by the Ministry of Education and Culture of the Republic of Indonesia. The independent curriculum implementation is fully supported by learning tools that make students active, one of which is the Student Worksheet [4]. Student Worksheet is a means to help students develop active learning, be able to establish effective interaction between teachers and students, and improve their ability to solve problems with creative thinking [5]. Student Worksheet can also activate learning independence in students with the help of learning models such as the phenomenon based learning (PhenoBL) model.

Phenomenon-based learning is an educational approach that centers on real-world phenomena encountered in everyday life. In this model, students take an active role in exploring and understanding these phenomena while also addressing the associated challenges. Phenomenon-based learning was first implemented in Finland in 2016 as a curriculum by requiring teachers to teach based on a phenomenon-based learning approach that utilizes the out-of-school environment and innovative technology to increase students' involvement, interest, and activeness in learning [6].

The results of interviews with chemistry teachers from SMA N 15 Pekanbaru and SMA N 9 Pekanbaru, found that both schools have used the independent curriculum, but have never used student worksheet which is developed digitally and with a learning model, especially the phenomenon based learning (PhenoBL) model in reaction rate material as a learning resource. One alternative to overcome these problems is to combine the Phenomenon Based Learning (PhenoBL) model with E-Student Worksheet or electronic student worksheet in order to develop students' thinking skills and the formation of interactive learning.

The use of E-Student Worksheet in education is urgently needed because sophisticated technology demands to utilize teaching materials in digital form and utilize media to provide real experiences to students so that learning is more effective [7]. There are many types of E-Student Worksheet that can make students learn interactively, one of which is by using the Wizer.me website. The Wizer.me website has several advantages, namely that Student Worksheet can be easily accessed using any electronic device such as a smartphone or laptop, Student Worksheet is also attractively packaged because it is supported by the format that has been provided wizer.me, the question features provided are also varied and can be used according to the needs of teachers[8].

2. MATERIAL AND METHODS

The type of research used is research and development, which is a type of research that aims to develop a product that begins with needs research and then development is carried out to produce a valid product.

The model of development that is used as a reference in this study is the 4D model (Four D), which is one of the development models that is suitable for developing a product[9]. The developed product undergoes feasibility testing to validate its effectiveness. This process is structured into four stages: Define, Design, Develop, and Disseminate. However, this research concluded after the Develop stage, without advancing to Disseminate.

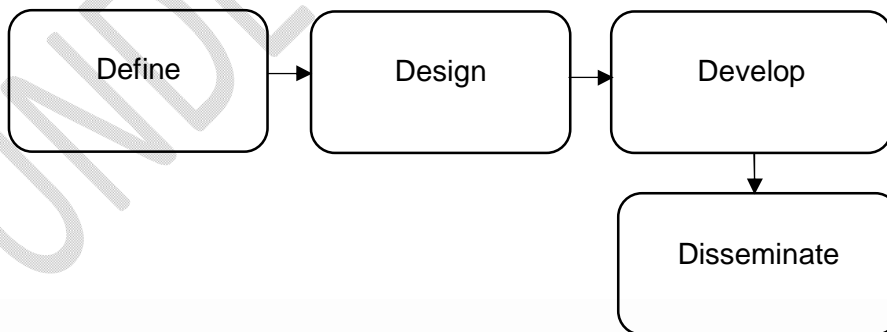


Fig. 1 4-D Model Development Flow

2.1. Method of Qualitative Analysis

Qualitative data were obtained from interviews with grade XI chemistry teachers of SMAN 9 Pekanbaru and SMAN 15 Pekanbaru, inputs, responses, and criticisms from material expert validators and media expert validators, and user responses.

2.2. Method of Quantitative Analysis

Quantitative data in the form of scores for each assessment indicator on the E-Student Worksheet validation instrument based on the PhenoBL learning model on the Reaction Rate material with the Wizer.me website for Class XI High School/MA equivalent which is completed by material expert validators and media expert validators. The evaluation of each indicator obtained is then converted into a score with a Likert scale to obtain the criteria and validity level of the E-Student Worksheet based on the Phenomenon-Based Learning learning model on the Reaction Rate material with the Wizer.me website for Class XI High School/MA Equivalent developed and a product trial questionnaire filled out by teachers and students from SMAN 9 Pekanbaru and SMAN 15 Pekanbaru who have studied the reaction rate material. The results of the teacher and student response questionnaires are then classified based on practicality criteria.

2.2.1. Development Product Validity Analysis

Analysis of the validity of the E-Student Worksheet based on phenomenon-based learning as a teaching material for high school chemistry learning grade XI on the reaction rate material to the feasibility of the content, the linguistic aspect, the presentation aspect, and the graphic aspect.

Table 1. Validator Assessment Category

Assesment Score	Category
4	SS: Very Good
3	S: Good
2	KS: Less Good
1	TS: Not Good

The validation results are calculated by the average score formula, which is by the equation:

$$\text{Percentage} = \frac{\text{Score Obtained}}{\text{Maximum Score}} \times 100\%$$

Then the results of the validation sheet percentage were converted according to the scale evaluation criteria to make a decision on the quality of the E-Student Worksheet based on the Phenomenon-Based Learning learning model on the reaction rate material using the wizer.me website for Class XI High School/MA. Performance level conversion as shown in Table 2.

Table 2. Validator Assessment

Percentage	Criteria
80,00-100	Good/Valid/Decent
60,00-79,00	Good Enough/ Valid Enough/ Decent Enough
50,00-59,99	LessGood/Less Valid/LessDecent
0-49,00	NotGood/NotValid

2.2.2. User Response

Teacher's Response

The teacher response questionnaire is structured as a checklist utilizing the Likert scale. Each item prompts a response based on an alternative positive attitude statement, which can range from very positive to very negative. To quantify these responses, the alternative positive attitude statements are assigned scores based on a four-point Likert scale, as illustrated in Table 1.

The results of the alternative data on positive statements about teachers' attitudes are calculated using the mean score formula, which is given by the equation:

$$\text{Percentage} = \frac{\text{Score Obtained}}{\text{Maximum Score}} \times 100\%$$

Then the results of alternative data on positive questions of teacher attitudes were converted according to the scale evaluation criteria to make decisions about the quality of E-student worksheet based on the Phenomenon-Based Learning model on the reaction rate material using the wizer.me website. Performance level conversion as shown in Table 3.

Table 3. Teacher's Response Assessment Criteria

Percentage	Criteria
80,00-100	Good
60,00-79,00	Good Enough
50,00-59,99	LessGood
0-49,00	NotGood

Student's Response

The student response questionnaire utilized a Likert scale presented as a checklist (√). Each item on the instrument was designed to assess attitudes through an alternative positive statement, ranging from very positive to very negative. These statements were then converted into scores using a 1-4 Likert scale, as illustrated in Table 1.

Then the results of the alternative data on positive questions of students' attitudes were converted according to the scale scoring criteria to make decisions about the quality of the E-Student Worksheet based on the Phenomenon-Based Learning model on the reaction rate material using the wizer.me website. The performance level conversions are shown in Table 3.

3. RESULTS AND DISCUSSION

3.1. Result

The research conducted has resulted in a product in the form of E-Student Worksheet Based on Phenomenon Based Learning (PhenoBL) on Reaction Rate Material Using the Wizer.me Website for Class XI High School/MA Equivalent. This research employed the Research and Development (R&D) methodology alongside the 4-D model, which encompasses defining, designing, developing, and disseminating. The study was conducted up to the development phase, where an expert validation was carried out to assess the feasibility of the E-Student Worksheet. Following this, one-on-one testing and user response evaluations were conducted with both students and teachers.

3.1.1. Define

In this Define step, information about needs is obtained from four main steps, namely front-end analysis, concept analysis, task analysis, and formulation of dissemination objectives.

3.1.2. Design

This design phase resulted in the initial design of an E-Student Worksheet based on the PhenoBL learning model using the Wizer.me website.



Fig. 2 E-Student Worksheet Design

The first draft of the E-Student Worksheet contains components that include a cover page with the title and identity of the E-Student Worksheet, CP and TP, instructions for using the E-Student Worksheet, the contents of the E-Student Worksheet, learning materials, and a bibliography. In addition, the initial design also includes research tools that include materials and media expert validation sheets, teacher response questionnaires and student response questionnaires.

3.1.3. Develop

The develop E-Student Worksheet has been validated and tested to a limited extent. The result of the development phase of the E-Student Worksheet are described below:

1. Validation of E-student Worksheet

The validation produced quantitative data (Likert scale), which was then calculated as an average percentage, so that qualitative data was produced in the form of categories from the E-student worksheet, which was developed to consist of valid, moderately valid, less valid and invalid categories [9].

Table 4. Recapitulation of Material Validation Results

Eligibility Aspects	Validation I (%)	Information	Validation II (%)	Information
Aspects of Content	85%	Valid	97,5%	Valid
Aspects of Phenomenon Based Learning	87,5%	Valid	100%	Valid
Aspects of Serving	80%	Valid	95%	Valid
Aspects Language	66,6%	Valid Enough	100%	Valid
Graphics	87,5%	Valid	100%	Valid

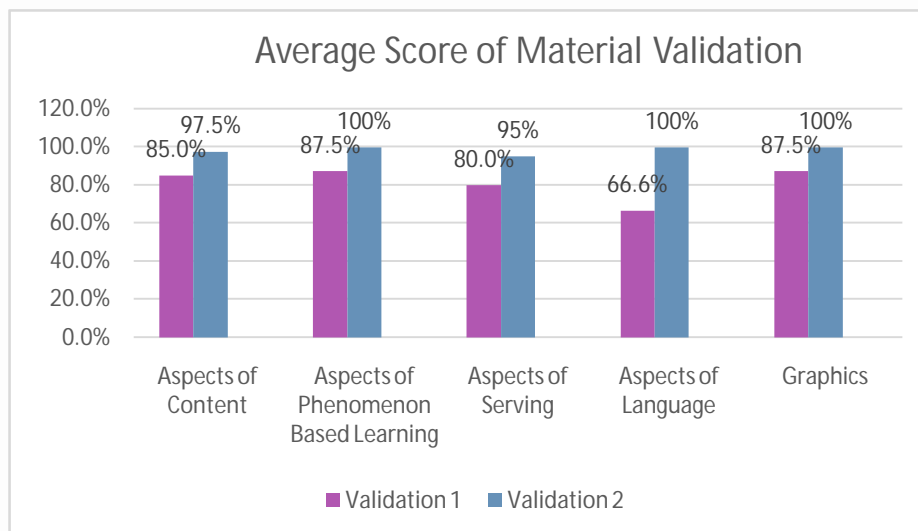


Fig. 3 Average Score of Material Validation

Table 5. Recapitulation of Media Validation Results

Eligibility Aspects	Validation I (%)	Information	Validation II (%)	Information
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Aspects of Display (Visual Communication)	88,8%	Valid	100%	Valid
Aspects of Software Utilization	100%	Valid	100%	Valid

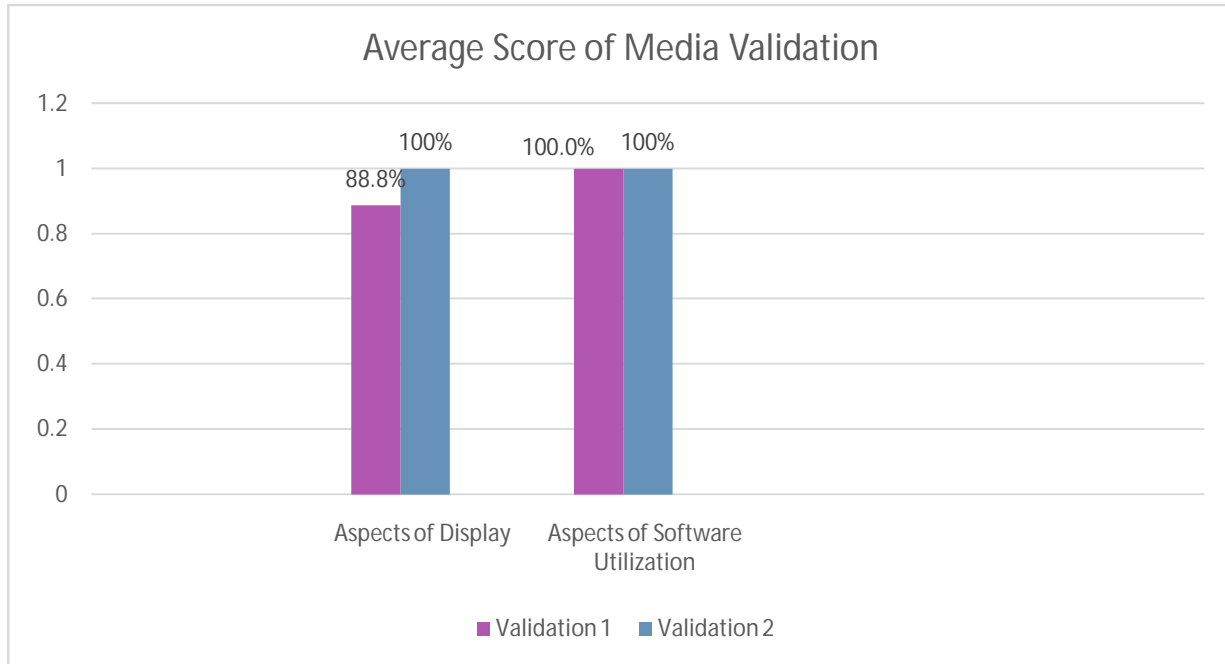


FIGURE 4. Average Score of Media Validation

2. User Response

The user response test consists of a teacher response test, a student response test, and a one-on-one test. Teacher response tests were conducted on 2 teachers from SMAN 15 and SMAN 9 Pekanbaru, student response tests were conducted on 20 students from SMAN 15 Pekanbaru and SMAN 9 Pekanbaru, and one-on-one tests were conducted on 3 students from SMAN 15 Pekanbaru.

Table 6. Recapitulation of Teacher Response Result

Eligibility Aspects	Average Percentage (%)	Information
Content	95,83%	Very Good
Aspects of <i>Phenomenon Based Learning</i>	97,5%	Very Good
Ease of Use	87,5%	Very Good
Benefit of Use	93,75%	Very Good
Attractiveness of Presentation	87,5%	Very Good
Average Overall Percentage	92,41%	Very Good

Table 7. Recapitulation of Student Response Result

Eligibility Aspects	SMA N 15 Pekanbaru	SMA N 9 Pekanbaru	Overall Average Percentage (%)	Information
Ease of Use	88,75%	90%	89,37%	Very Good
Benefits of Use	84,5%	90,5%	87,5%	Very Good
Attractiveness of Presentation	89,58	93,75%	91,66%	Very Good
Average Overall Percentage (%)			89,51%	Very Good

3.2. Discussion

3.2.1. Validation of E-Student Worksheet

A product is said to be good/feasible if it meets quality criteria, including validity, practicality, and effectiveness [10]. The developed E-Student Worksheet will be tested for validity by 3 expert validators, namely 2 material expert validators and 1 media expert validator. The developed product will be declared valid if the product has been validated and has received valid criteria.

The material validation process by material experts is carried out 2 times for each validator. In the validation of the material, there are 5 aspects of feasibility are assessed, namely the feasibility of content, the feasibility of phenomenon-based learning characteristics, the feasibility of presentation, the feasibility of language, and feasibility of graphics. These five aspects has been developed into 20 statements. Materials experts provide comments and suggestions to improve the E-Student Worksheet so that it is suitable for learning. The results of material validation in terms of content aspects of content, aspects of phenomenon-based learning aspects, presentation aspects, language aspects, and graphics were 97.5%, 100%, 95%, 100% and 100% respectively.

There are 2 aspects of feasibility assessed by the media expert validators, namely the feasibility of display (visual communication) and the feasibility of using software. These two aspects were developed into 14 statements. The media validation process by media experts is carried out 2 times. The media experts provide comments and suggestions to improve the E-student worksheet so that it is suitable for learning. The results of media validation from the display aspect, and the software use aspect are 100%, and 100% respectively.

3.2.2. User Response

An educational resource, including E-LKPD, is considered well-designed when it fulfills effectiveness criteria [10]. E-Student Worksheet is deemed effective if students demonstrate success in their learning journey and if there is alignment in the curriculum regarding their learning experiences and achievement of outcomes. Furthermore, a development product is regarded as practical when it is user-friendly for both students and teachers, offering more comprehensive content than standard textbooks [10]. Ibrahim & Subali [11]. emphasized that the practicality of a development product can be assessed by observing the ease or difficulty users encounter when utilizing the product. To evaluate both effectiveness and practicality, user response tests were conducted with teachers and students, along with one-on-one assessments.

The experiment, E-LKPD was conducted in 2 schools, namely SMA N 15 Pekanbaru and SMA N 9 Pekanbaru. The experiment was conducted in 3 sessions using E-LKPD based on the Phenomenon Based Learning (PhenoBL) learning model on reaction rate materials using the Wizer.me website. The trial activities carried out are teacher response tests, student response tests and one-on-one trials.

The teacher response test was carried out by providing a link to an E-student worksheet based on the Phenomenon-based learning model on the reaction rate material using the Wizer.me website and also given in printed form. The teacher sees and pays attention to the given E-student worksheet and then evaluates the E-student worksheet based on the teacher's evaluation sheet on the given E-student worksheet. The results of the teacher response test were very positive and in line with the validation results on the aspects of content suitability, characteristics of phenomenon-based learning, presentation, grammar, and graphics. There was a small suggestion for the 2nd E-student worksheet in the discourse section of Activity 3, but according to the teacher for the overall E-student worksheet was very good, as evidenced by the response result of 92.41% with very good criteria.

The student response test was conducted with 20 students. 10 students from SMA N 15 Pekanbaru and 10 students from SMA N 9 Pekanbaru. Before providing an access link to E-student worksheet based on the phenomenon-based learning model on the reaction rate material using the Wizer.me website, the researcher first explained the researcher's intentions and objectives to the students. The researcher also gave a brief explanation of the E-student worksheet based on the phenomenon-based learning model on the reaction rate material using the Wizer.me website. The student response questionnaire is given after the student has finished working on the E-student worksheet, with the assessment component according to the questionnaire grid.

The result of the student response test was that the students found that the E-student worksheet was easy to use, understandable, could provide knowledge and the students expressed interest in using the E-student worksheet as a learning resource/book at school or at home. Students are also active in the experiment carried out. The evaluation of the students' responses was obtained at 89.51% with very good criteria.

The one-on-one testing stage involved three students from SMA N 15 Pekanbaru with different cognitive abilities. The implementation of this stage aims to identify errors/shortcomings/weaknesses of E-student worksheet when used by students. Student feedback on E-student worksheet, students said that E-student worksheet is practical and very easy to use, the material in E-student worksheet is clearly explained and there are learning videos to help students find information.

However, there are a some obstacles in working on the E-student worksheet using an Android mobile phone, the size of the display on the E-student worksheet does not match the mobile phone screen but this can be overcome by changing the screen from portrait to landscape. Then the students also said that the activities/questions in the 2nd E-student worksheet regarding the factors that affect the reaction rate are too much, this is a consideration for the researcher to reduce the number of questions in the E-student worksheet.

Based on the results of the user response questionnaire (teachers and students), it can be concluded that the development E-Student Worksheet meets the criteria of effectiveness and practicality according to Nieveen[10].

4. CONCLUSION

The results of the research on the development of an E-Student Worksheet based on the Phenomenon-Based Learning (PhenoBL) learning model on reaction rate materials using the Wizer.mewebsite for Class XI High School/MA were declared valid based on the results of material and media validation. The results of material validation in terms of content suitability, Phenomenon-Based Learning (PhenoBL) characteristics, language, presentation and graphics were 97.5%, 100%, 95%, 100%, and 100% respectively. The results of media validation in terms of E-Student Worksheet display and software usage are 100% and 100%. The results of the user response test were 92.41% for chemistry teachers with very good criteria and 89.51% for students with very good criteria.

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