DEVELOPMENT OF STUDENT WORKSHEETS BASED ON BLENDED LEARNING MODEL FOR STATION-ROTATIONAL LITERATURE SKILL ORIENTED R.I 4.0

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ABSTRACT

Education in the era of generation z is required to have skills that can answer the challenges of the industrial revolution 4.0. One of the important skills to be developed is literacy skills. However, Indonesia's literacy level is not more than 50 in Asia, this affects the integration of literacy skills in content and learning processes so that there has been no significant increase. In order for students to have the skills of the 4.0 revolution era, student worksheets that are oriented towards literacy skills are developed with the blended learning station rotational model. The purpose of this study was to determine the validity and practicality of student worksheets based on blended learning oriented literacy skills R.I 4.0. The research conducted includes the type of research and development (R&D). The research step is to analyze the existing problem, then design the product, then develop a product that will be validated by experts. After the product is validated and repaired in accordance with the expert's response, the product will be tested or carried out practicality by teachers and students. Products can be evaluated at each activity, this can minimize product deficiencies. The data instruments used in the study were validity test sheets and practicality test sheets. The data analysis technique used is product validity analysis and product practicality analysis. Based on the analysis of the data used, two research results were obtained, namely first, skill literacy-oriented worksheets have very valid validity. Second, the level of practicality assessed by the teacher is very practical and the level of practicality of students is at a very practical level as well. So that skill literacy-based worksheets are declared valid and practical to use in learning.

Keywords: Industrial Revolution 4.0; literacy skills; student worksheets.

I. INTRODUCTION

Today the term Industrial Revolution 4.0 is often discussed. The Industrial Revolution 4.0 itself is an amalgamation of digital technology and the internet in industrial aspects so that systems that are usually done manually can be replaced with automatic commands [1]. With increasingly advanced technology, there will be a reduction in manual labor, namely humans who will be replaced by technology. So that this does not happen, it is necessary to increase human resources. One way to increase human resources is by increasing education.

Education in the Industrial Revolution 4.0 era must be harmonized with existing challenges in order to create new innovations that can answer these challenges [2]. The learning process carried out should not only convey the material, but also hone the skills of students. The skills that must be possessed in order to be able to answer the challenges of the Industrial Revolution 4.0 include: critical thinking skills, knowledge, digital literacy skills, information, media, and being able to master information and communication technology [3]. This is confirmed by the opinion of Wongso which states that there are three main literacies that need to be developed in the 4.0 Industrial Revolution era, namely: data literacy, technological literacy, and human literacy [4].

Primary literacy which can also be called skill literacy is literacy that strengthens old literacy. The old literacy in question is calistung skills (reading, writing, and arithmetic). While the main literacy or literacy skills...
are: data literacy, technological literacy, and human literacy. Data literacy is the ability to read, analyze, and conclude data based on the information obtained. Technological literacy is the skill of understanding how machines work, applying technology to facilitate work in order to get optimal results. Human literacy is a skill to communicate, socialize, think critically, creatively, and innovatively [5].

Based on the results of observations made at senior high school 2 Agam, it was found that the use of technology in the learning process was still minimally used. This is in stark contrast to the literacy skills that were developed during the Industrial Revolution 4.0 where many things were integrated with technology, including education. From the results of observational analysis, it was found that the industrial revolution 4.0 skill literacy in physics learning obtained a value of 63.8 in data literacy, 46.9 in technological literacy, and 53.2 in human literacy. Based on these data, the average value of literacy skills in physics learning at MAN 2 Agam is 55 which is in the fairly good category. This shows that the orientation of literacy skills in physics learning at MAN 2 Agam is still lacking.

The problem of low literacy skills of students can be overcome by various solutions, one of which is to facilitate the learning process with teaching materials that lead to the achievement of these skills. The teaching materials developed in this study were student worksheets. Student worksheets is a collection of sheets composed of a summary of the material, a collection of questions, instructions and activity steps that help students understand the material and refer to the achievement of basic competencies [6]. Student worksheets was chosen because it is considered capable of directing students to learn independently so that the learning process in the classroom is student-centred. In addition, the use of student worksheets aims so that students are able to play an active role when learning and the formation of a cooperative, disciplined, and cooperative attitude.

The learning process will be carried out using a rotational blended learning station model which is expected to be able to integrate the industrial revolution 4.0 skill literacy. Blended learning learning model is a learning process that combines online learning that utilizes technology and face-to-face learning in the classroom [8]. While the rotational station is one of the classifications of blended learning in which the learning process rotates from online classes to face-to-face classes according to the learning schedule that has been arranged [9].

Before this research was conducted, research related to the development of student worksheets-oriented literacy skills or new literacy and student worksheets were developed with a blended learning process [10][11][12]. The research conducted is different from previous research but both develop learning tools with blended learning models and literacy skills. The location of the difference between this research and previous research is the material developed, the application for developing the material, and the teaching material developed.

II. METHOD

This research is Research and Development (R&D). R&D is the research used for produce a product after going through several stages. Then tested whether the product is feasible or not used. The results of this research are in the form of a Student Worksheet which is oriented towards RI 4.0 literacy skills on Newton's law materials as well as business and energy.

The research model carried out is the ADDIE model which has several stages as follows: Analysis, Design, Development, Implementation and Evaluation. The instrument used to collect data is a validity test sheet that will be filled out by experts. The analytical technique used to analyze the product is the graphical method.

Instrument appraisal: The validity of the student worksheets oriented literacy skills was compiled using a Likert scale. Results validation: Experts will be analyzed in two stages, namely: first, the researcher will add up the scores given by the experts on each indicator, and secondly will be givenevaluationin accordance with the category validity value. The validity value is searched using the equation to get the total average value of all indicators in [13].

The level of achievement of the student worksheets validity category uses the classification as shown in Table 1 below:

<table>
<thead>
<tr>
<th>Achievement Rank</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 20</td>
<td>Invalid</td>
</tr>
<tr>
<td>21 – 40</td>
<td>Less Valid</td>
</tr>
<tr>
<td>41 – 60</td>
<td>Quite Valid</td>
</tr>
<tr>
<td>61 – 80</td>
<td>Valid</td>
</tr>
<tr>
<td>81 – 100</td>
<td>Very Valid</td>
</tr>
</tbody>
</table>

(Source: Ref[13])
Analysis of the validity of the student worksheets was carried out using descriptive statistics depicted using graphs. The validity value starts from the range 0-100, but the value used is values that lie in the range 61-100. This value lies in the valid and very valid categories.

III. RESULTS AND DISCUSSION

After doing research on the development of student worksheets physics oriented literacy skills on Newton's law material as well as work and energy, the results obtained in the form of validity values from experts. After the student worksheets is assessed by experts, a revision will be made to the product by taking into account suggestions and inputs related to product deficiencies and limitations. It aims to obtain maximum results.

Validation is done by filling out the validation instrument by four experts. Then the results of the filling will be analyzed as a reference to determine the feasibility of the product and revise the product. The analysis is carried out by averaging the value of each indicator contained in the product assessment component. The results of the validation of student worksheets physics oriented literacy skills are explained as follows.

The assessment instrument for the validation of student worksheets physics oriented literacy skills consists of four assessment components. The assessment components used are: material substance, learning design, display (visual communication), and software utilization. The first component is the substance of the material consisting of four sub-indicators, namely: material physics, technological literacy, data literacy, human literacy.

The first sub-indicator, namely the substance of physics material, consists of: 1) student worksheets presented does not deviate from the truth of physics material for basic competence 3.7 and 3.9, 2) student worksheets presented in accordance with the depth of physics material for basic competence 3.7 and 3.9, 3) student worksheets presented in accordance with development of physics, 4) student worksheets presented using standard and understandable grammar. The results of the material substance plot can be seen in Figure 1 below:

![Fig 1. Validation value on the substance of the material](image1.png)

Based on the four sub-indicators of material substance in the student worksheets, four sub-indicators are very valid with values of 81.3 on the third and fourth indicators and 87.5 on the first and second indicators respectively. From the four indicators, it can be determined that the average value of the material substance is 84.4 which is in the very valid category.

The second sub-indicator, namely technological literacy, consists of: 5) Instructions on activities in student worksheets according to students being able to use the internet (applying technology), 6) Instructions on activities in student worksheets according to students being able to connect science with technology, 7) Activities in student worksheets demanding students are able to evaluate by utilizing technology. The results of the data literacy plot can be seen in Figure 2:

![Fig 2. Validation value on technological literacy](image2.png)
Based on Figure 2 the average value of technological literacy ranges from 81.3 to 87.5. The lowest value of 81.3 is in the sixth and seventh sub-indicators. While the highest value of 87.5 is in the fifth sub-indicator. The average score for technological literacy is 83.3. The value of the validity of technological literacy is classified as very valid.

The third indicator of material substance is data literacy which contains 4 sub-indicators, namely: 8) Instructions on activities in student worksheets guides students to be able to organize data, 9) Instructions on activities in student worksheets according to students are able to analyze data, 10) Instructions on activities in student worksheets according to students are able to communicate the results of data analysis, 11) Instructions on activities in student worksheets according to students are able to make thinking conclusions based on data. The results of the data literacy sub indicator plot can be seen in Figure 3 below:

Fig 3. Data literacy indicator validation value

Based on Figure 3 the average value of data literacy ranges from 75 to 81.3. The lowest value of 75 is found in the eighth, tenth and eleventh sub-indicators. While the highest value of 81.3 is in the ninth sub-indicator. The average value for data literacy is 76.6. The value of the validity of data literacy is classified as valid.

The fourth indicator of material substance is human literacy. There are 3 sub indicators of human literacy, namely: 12) Instructions on activities in student worksheets according to students are able to rearrange concepts, 13) Instructions on activities in student worksheets according to students are able to connect concepts by communicating in written form (making reports) or verbally (presenting), 14) Instructions on activities in student worksheets according to students are able to think critically. The results of the human literacy plot can be observed in Figure 4:

Fig 4. Validation value of human literacy indicators

Based on Figure 4 the average value of human literacy ranges from 81.3 to 87.5. The lowest value of 81.3 is in the twelfth sub-indicator. While the highest value of 87.5 is in the thirteenth and fourteenth sub-indicators. The average score for human literacy is 85.4. The value of the validity of human literacy is classified as very valid.

Overall, if the average results of the material substance indicators are plotted in graphical form, it can be observed in Figure 5:
Fig 5. Material substance component validation value

The value of the substance component values based on Figure 5 ranges from 76.6 to 85.4. After the average value of the material substance component is 82.4. So that the validation results on the substance components of the material can be categorized into a very valid category.

The second component of the validation instrument is the learning design. In the learning design component, there are two indicators, namely: 1) student worksheets design, and 2) blended learning design. In the student worksheets design sub-indicators there are 5 sub-indicators of learning design, namely: 15) The title of the student worksheets is in accordance with each material, namely basic competence 3.7 and basic competence 3.9, 16) The material on the student worksheets is in accordance with the SK and basic competence, 17) Sample questions on the student worksheets are in accordance with learning indicators, 18) The identity of the compilers in the student worksheets is complete and clear, 19) The reference list is always present at the end of the student worksheets in every meeting. The results of the student worksheets design plot can be seen in Figure 6:

Fig 6. Validation value of student worksheets design indicators

Based on Figure 6, the average value of the student worksheets design ranges from 87.5 to 100. The lowest value of 87.5 is in the fifteenth sub-indicator. The middle value of 93.8 is in the eighteenth sub-indicator. While the highest value of 100 is in the sixteenth, seventeenth, and nineteenth sub-indicators. The mean score for the student worksheets design is 96.3. The value of the student worksheets design validity is classified as very valid.

The second learning design indicator is the blended learning design. In the blended learning design indicators there are 7 sub-indicators, namely: 20) student worksheets learning structure is designed in an instructional manner, 21) student worksheets initial appearance, 22) work activities in student worksheets are interactive and communicative, 23) student worksheets directs the learning process, 24) student worksheets content supports learning process, 25) student worksheets used using technology design, 26) practice questions on student worksheets according to indicators. The results of the blended learning learning design plot can be seen in Figure 7:
Based on Figure 7 the average value of blended learning ranged from 81.3 to 87.5. The lowest value of 81.3 is in the sub-indicators twenty-second, twenty-third, twenty-fourth, and twenty-sixth. While the highest value of 87.5 is in the twentieth sub-indicator, twenty-one, and twenty-fifth. The average score for the blended learning design is 83.9. Mark validity blended learning design is classified as very valid.

Overall, if the average results of the material substance indicators are plotted on a graph, it can be observed in Figure 8:

The value of the instructional design component based on Figure 8 ranges from 83.9 to 96.3. After the average value of the learning design component is 90.1. Thus, the validation results for the substance component of the material are categorized into a very valid category.

The third component of the validation instrument is the display (visual communication). The display component (visual communication) has 7 indicators as follows: 27) Ease of access between slides/screens, 28) Proportion between font size and slide space, 29) Type and size of fonts are easy to read, 30) Images, sound, video according to the material presented, 31) Harmonization of colors and contrast levels, 32) Animation according to the material, 33) The layout design in the student worksheets is proportional. The results of the plot of the display component (visual communication) can be observed in Figure 9:

The value of the display component (visual communication) based on Figure 9 is obtained ranging from 81.3 to 93.8. The lowest score of 81.3 was obtained at the thirtieth, thirty-first, and thirty-second indicators. The median
value of 87.5 was obtained at the twenty-seventh, twenty-ninth, and thirty-third indicators. While the highest value of 93.8 is in the twenty-eighth indicator. After the average value of the display component (visual communication) is 85.7. The category of the validity of the visual communication component is in the very valid category.

The last component is the use of software. In this component there are 3 indicators as follows: 34) Feedback from the system to users (students) on student worksheets is easy to use, 35) Use of supporting software other than the main software for making student worksheets, 36) Originality of student worksheets. The results of the plot of the components of software utilization can be observed in Figure 10:

![Fig 10](image)

The indicator of the software utilization component has a validation value of 87.5 for each component. So the average of software utilization indicators is 87.5. Based on the category of validity, the components of the use of software have a very valid category.

Overall the values of the student worksheets validation components oriented literacy skills RI 4.0 are averaged and the validity value of each component can be seen in Figure 11 below:

![Fig 11](image)

The results of the analysis of each component shown in Figure 11 state that the lowest value contained in the material substance component is 82.4. While the highest value is found in the learning design component, which is 90.1. The results of this analysis can be seen in the appendix. The value of each validation component is averaged to obtain a value of 86.4. The results of the validity of the RI 4.0 literacy-oriented skill literacy student worksheets can be categorized as very valid.

IV. CONCLUSION

The conclusion that the author can explain based on the analysis of the research results and discussion is the validity of the RI 4.0 literacy-oriented student worksheets skills on Newton's Law and Work and Energy material, which has an average validity value of 86.4 experts. This value is in the very valid category. So it can be stated that student worksheets physics oriented literacy skills can be used and the learning process.

REFERENCES


