

## THE AVAILABILITY ANALYSIS OF 21<sup>ST</sup> CENTURY SKILL INDICATORS ON PHYSICS WORKSHEET OF SENIOR HIGH SCHOOL GRADE X SEMESTER 1

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### ABSTRACT

To achieve educational goals in the 21<sup>st</sup> century, teachers must prepare teaching materials. One of the teaching materials that can be used by teachers in the learning process is worksheets. Worksheets that can help students develop 21<sup>st</sup> century skills are worksheets that contain indicators of 21<sup>st</sup> century skills. Based on the results of preliminary observations made in the field, the student worksheets used by schools in Pasaman District still vary. It is not known whether these various worksheets include indicators of 21<sup>st</sup> century skills. Therefore, a study was conducted with the aim of analyzing the 21<sup>st</sup> century skill indicator table in physics worksheets grade X Semester 1 in Pasaman District. This type of research is a descriptive study with a qualitative approach. The population in this study were all Physics Worksheets grade X Semester 1 used by 12 public Senior High School in Pasaman Districts. Meanwhile, the sample of student worksheets in this study used a total sampling technique. The sample of worksheet in this study were 2 worksheet published by publishers which were used the most by schools in Pasaman district, and 3 worksheet made by physics subject teachers. Based on the results of the study, it is concluded that the 21<sup>st</sup> century skill indicator with the highest 37% is in the LKS Intan Pariwara by Risdiyani Chasanah and friends. Meanwhile, and friends with a proportion of 12% in the category of not facilitating.

**Keywords :** Analysis, Student Worksheet, 21<sup>st</sup> Century Skill Indicators



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### I. INTRODUCTION

Education will continue to develop in accordance with the times. In the 21<sup>st</sup> century Science and Technology is developing very rapidly. Students in the 21<sup>st</sup> century are faced with an era of globalization that requires adequate life skills. The 21<sup>st</sup> century curriculum is a curriculum that demands the future world which requires students to have critical thinking skills, creative thinking skills, the ability to communicate with other students, and have the ability to collaborate in the learning process. The 2013 curriculum that is applied now prioritizes learning that carries these abilities. 21<sup>st</sup> century skills consist of critical thinking, creative thinking, communication and collaboration skills [1]. Mastery of 21<sup>st</sup> century skills is essential for students.

To achieve these goals the teacher must prepare learning models, learning strategies, learning media and teaching materials. One of the teaching materials that can be used by teachers in the learning process is worksheets. Worksheet is sheets containing material, summaries and instructions for implementing learning tasks that must be done by students [2]. Worksheet can help teachers in the learning process in accordance with the demands of the 2013 curriculum. The function of worksheet is to facilitate the implementation of teaching to students and as teaching materials that can minimize the role of educators but can activate students [3].

Based on the survey data above, information has been obtained about the use of very varied high school physics worksheets for Grade X Semester 1, which are written and designed by various private parties as well as from teachers who teach at the school. There are 2 types of worksheet used, namely worksheet issued from the

publisher / private sector and worksheet made by the teacher from the school it self. Worksheet issued from the publisher, namely worksheet from the publisher Intan Pariwara and Viva Pakarindo. Even though it has been published and has been used, most of the schools do not know which worksheet is good to use as a study guide in accordance with the 2013.

From the description above, it can be seen that there is consider between ideal conditions and conditions which is actually in the field. Where is the worksheet found in schools unknown whether it can facilitate 21<sup>st</sup> century skill indicators. For that, research is needed that is done to see and analyze 21<sup>st</sup> century skill indicators and questions with the 21<sup>st</sup> century skill indicators. Category in the worksheet used by grade X high school students in Pasaman Districts. Therefore, the researcher raised the title research "Analysis of 21<sup>st</sup> century skill indicators on Physics Worksheet of Senior High School Grade X Semester 1 In Pasaman Districts".

## II. METHOD

This research is descriptive research with a qualitative approach in order to find out whether the grade X Physics worksheets offer semester 1 already contains the 21<sup>st</sup> Century Skill Indicators. This research was conducted for grade X Senior High School is in Pasaman Districts. Basically research descriptive aims to describe a phenomenon or event so as to explain or decrypt something like what existence. Research with a qualitative approach is research that produces data descriptive in the form of written words of something observed [4][5]. The population in this study were all Physics Worksheets Grade X Semester 1 used by 12 public Senior High School in Pasaman Districts. Furthermore, for the school sampling technique using purposive sampling technique with schools selected by high category schools, medium category schools and low category schools based on the results of the 2019 National Examination of the total high school population in Pasaman Regency. Meanwhile, the sample of student worksheets in this study used a total sampling technique. The sample of worksheet in this study were 2 worksheet published by publishers which were used the most by schools in Pasaman District, and 3 worksheet made by physics subject teachers.

The first worksheet is the worksheet issued by Viva Pakarindo (VP), which was compiled by Puji Astuti et al with the publication year of 2018. The second worksheet used is the worksheet from the publisher Intan Pariwara (IP), compiled by Risdiyani Chasanah et al with the publication year of 2019. Furthermore the worksheets made by the teacher at the school concerned that were used as samples in this study included worksheets made by the physics teacher from SMAN 1 Lubuk Sikaping (SMA A), worksheets made by the physics teacher at SMAN 1 Tigo Nagari (SMA B), and LKS made by the Physics Teacher of SMAN 1 Duo Koto (SMA C). The researchers selected the school sample by grouping the schools concerned, starting from schools with high categories, schools with middle categories, to schools with low categories [6]. The samples taken from this study were 3 worksheet made by the teacher of each school in Pasaman Districts and 2 worksheet published by the publisher and were mostly used in Pasaman Districts for Senior High School Grade X Semester 1.

This research was carried out in three stages namely the preparation stage, the implementation stage and the stage completion [7]. There are several preparatory stages things to do are like preparing 3 research design, determine the subject and object research, compile draft instruments, conduct tests instrument validation and analyze test results instrument validation. The instrument is a tool used for help find research objectives. The instrument in this study was a sheet the analysis instrument for Grade X Physics Worksheets Semester 1 is related to the 21<sup>st</sup> Century Skill Indicators [8]. This instrument is divided into two parts namely the first table to analyze availability questions in the HOTS category on the worksheet analyzed then the second table, namely the section for analyze the availability of 21<sup>st</sup> Century Skill indicator on material in the worksheets. In the first table of the instrument contains KKO on questions with the LOTS category to HOTS, which is then written the question number that fall into that category [5]. For the table second, where each instrument item is marked check the "there" column if found its existence and is given a tick in the column "No" if no item is found the instrument on the analyzed worksheets.

Assessment of the validity of the instrument is carried out by 3 expert lecturers using sheets instrument validation. Assessment of instrument validity analysis of physics worksheets related to 21<sup>st</sup> Century Skill Indicators it is a checklist on a scale of 1 to 5. Overall validity results were sought using the kappa cohen formula with equation:

$$\text{Moment Kappa } (K) = \frac{Po - Pe}{1 - Pe}$$

The k symbol in the equation represents the moment kappa which shows the validity of the instrument. The Po symbol in the equation denotes proportion which is realized which is calculated by means of the amount the

value given by the validator is divided by the number maximum [9]. Meanwhile,  $P_e$  shows proportion unrealized is calculated by means of the total value the maximum minus the total value that is given a validator divided by the maximum number. Category the decision of the kappa moment obtained is available in table 1.

**Table 1.** Decision Category based on moment kappa (k)

Interval	Category
0.81 - 1.00	Very valid
0.61 - 0.80	Valid
0.41 - 0.60	Moderate
0.21 - 0.40	Less valid
0.01 - 0.20	Invalid

The validity results obtained from three expert lecturers is in the very valid category. This can be seen in table 2

**Table 2.** The results of instrument validation by the validator

Validator	Score	Category
Validator 1	0.63	Valid
Validator 2	0.88	Very Valid
Validator 3	0.88	Very Valid

The instrument used has been validated by validator with an average validation of 0.80 which is included in the valid category, So that the instrument can be used. After validated there are several items in the instrument revision, namely the indicator of critical thinking by eliminating one of the sub indicators. Next there is also revisions to table 1 which contains analysis of questions in the HOTS category where one of the omitted tables is the short form questionnaire [12].

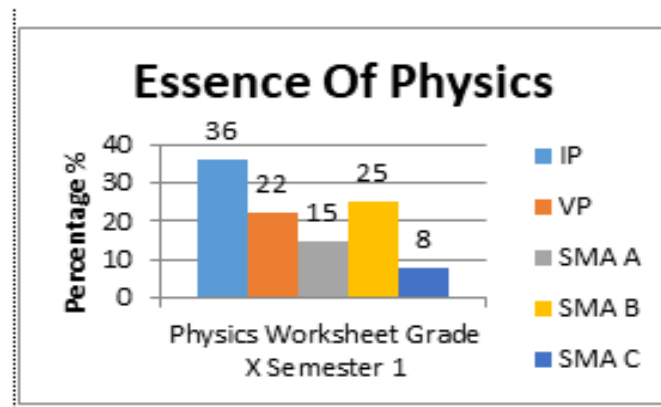
Data collection techniques are used is a doctoral study and interview. This technique require an instrument as a guide data retrieval [13]. Information is also obtained from various kinds of written sources. Yag documents used in this research in the form of documents written, namely worksheet Physics on Senior High School Grade X Semester 1. The data obtained is the presentation of high school physics worksheets grade X semester 1 which facilitates 21<sup>st</sup> century skills indicators. The data analysis technique used is content review [14]. Content review is a procedure used to draw correct conclusions of a document. This technique is carried out by adding up the presence of 21<sup>st</sup> century skill indicators and HOTS questions on each worksheet analyzed. Then calculate the percentage of the serving Physics worksheets for high school grade X semester I that get facilitates the 21<sup>st</sup> century skill indicator in each worksheet [15]. The value is obtained then adjusted to the criteria presentation. Criteria for grade X high school physics worksheets semester I related to the availability of 21<sup>st</sup> century skills indicators can be found in table 3.

**Table 3.** The criteria for offering high school physics worksheets for grade X semester 1 can facilitate the 21st Century Skills Indicators

Percentage Criteria	Category
81 - 100	Very facilitate
61 - 80	Can facilitate
41 - 60	Enough to facilitate
21 - 40	Less facilitate
0 - 20	Don't facilitate

### III. RESULTS AND DISCUSSION

The results of the analysis of the worksheets for the six worksheets on the essence of physics can be seen in Figure 1.

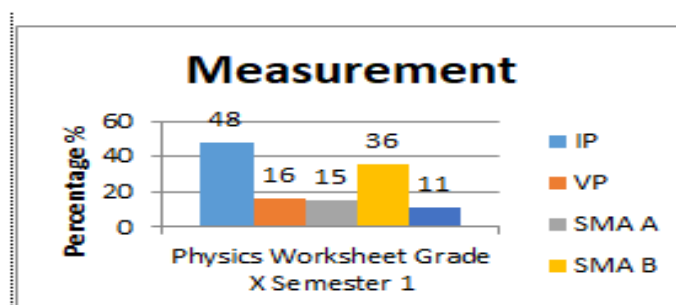


**Figure 1.** Percentage of Average Score Availability of Indicators of 21<sup>st</sup> Century Skills in the Essence of Physics

The graph above illustrates the results of the analysis of the availability of 21<sup>st</sup> century skills indicators where IP worksheets obtained an average percentage score of 36% with a less facilitating category, VP worksheets obtained an average percentage score of 22% with a less facilitating category, worksheet of SMA A got an average score 15% with the category of not facilitating, worksheet SMA B got an average score of 25% with the category less facilitating, worksheet SMA C got an average score of 8% with the category not facilitating.

Of the five worksheets analyzed, the availability of 21<sup>st</sup> Century Skills Indicators that most appeared for the nature of physics was the IP worksheets with a percentage score of 36% in the category of less facilitating. Compared to the other 4 worksheet, this worksheet has an advantage because it has met the indicators of critical thinking and communicating in the material section. Worksheet with the lowest score is worksheet of SMA C which is in the non-facilitating category because the availability of indicators in the worksheet is only indicators of critical thinking with a value of 8%.

Based on the results of the analysis on the nature of physics, indicators of 21<sup>st</sup> Century Skills that are fulfilled in IP worksheets are 67% critical thinking indicators with the facilitating category and 50% communication indicators with the sufficiently facilitating category. Then for worksheet of VP, the indicator of 21<sup>st</sup> century skills that has been fulfilled is creative thinking which gets a percentage of 71% with the category of facilitating. For worksheet of SMA A, there are no indicators of 21<sup>st</sup> century skills that have been fulfilled, based on the results of the analysis on the material for 21<sup>st</sup> century skills indicators, the highest is at a percentage of 33% with indicators of critical thinking skills in the category of less facilitating. Furthermore, for worksheet of SMA B, indicators of 21<sup>st</sup> century skills that have been met are indicators of critical thinking skills with a percentage of 67% in the category of facilitating, while for worksheet of SMA C, indicators of 21<sup>st</sup> century skills have not been met for each of the indicators.

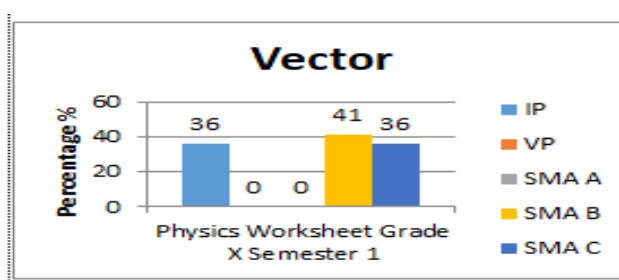


**Figure 2.** Percentage of Average Score Availability of 21<sup>st</sup> Century Skills Indicators on Measurement

The graph above can be seen that worksheet of IP obtained an average percentage score of 48% with a sufficiently facilitating category, worksheet of VP obtained an average percentage score of 16% in the non-facilitating category, LKS SMA A got an average score of 15% with the category not facilitating, worksheet of

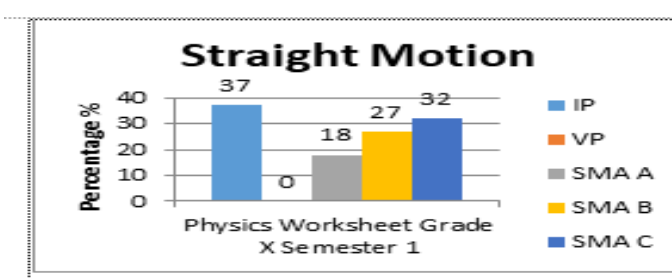
SMA B obtained an average score of 36% in the less facilitating category, worksheet of SMA C obtained an average score of 11% in the non-facilitating category. Of the five student worksheets analyzed, the 21<sup>st</sup> Century Skills Indicator that most appeared for measurement material was student worksheets of IP with a score of 48% in the category of Facilitating Enough. Compared to the other 4 worksheet, this worksheet has an advantage in indicators of creative thinking skills in the material part of the worksheet. Worksheet with the lowest score was worksheet of SMA C in the non-facilitating category with a percentage of 11%.

Based on the results of the analysis on the measurement material, the indicators of 21<sup>st</sup> century skills that are fulfilled in the IP worksheets are indicators of creative thinking and indicators of communication with the respective percentages of 57% and 58% with the sufficiently facilitating category. Then for worksheet of VP, there are no indicators of 21<sup>st</sup> century skills that have been fulfilled. For worksheet of SMA A, 21st Century Skills indicators have not been fulfilled either. Furthermore, for worksheet of SMA B the indicators that have been met are indicators of critical thinking and indicators of communication with the respective percentages, namely 67% and 79% in the category of facilitating. For worksheet of SMA C, the indicators that have been fulfilled are the indicators of communicating in the sufficiently facilitating category, namely 42%.



**Figure 3.** Percentage of Average Score Availability of 21<sup>st</sup> Century Skills Indicators on Vector material

From the graph above, it can be seen that worksheet of IP got an average percentage score of 36% with the category less facilitating, worksheet of SMA B got an average score of 41% with a sufficiently facilitating category, worksheet of SMA C got an average score of 36% with the category less facilitating, However, there was no 21st Century Skills indicator found in the worksheet of VP. Based on the results of the analysis on the vector material, indicators of 21<sup>st</sup> Century Skills that are fulfilled in worksheet of IP are critical thinking indicators, creative thinking indicators and collaborative indicators, where these three indicators are sufficient to facilitate. Meanwhile, in the first worksheets, there were no worksheets containing vector material. The 21<sup>st</sup> century skills indicator that most appeared for vector material was worksheet of SMA B with a percentage score of 41% in the Enough Facilitating category. Compared to the other 4 worksheet, this worksheet has the advantage of having met the indicators of critical thinking and communicating with the respective percentages, namely 100% and 50% in the very facilitating and sufficiently facilitating category. However, indicators of critical thinking are not found in this worksheet. Worksheet with the lowest score were worksheet of VP and worksheet of SMA A were in the non-facilitating category because the availability of indicators for 21<sup>st</sup> century skills was not found in this worksheet.

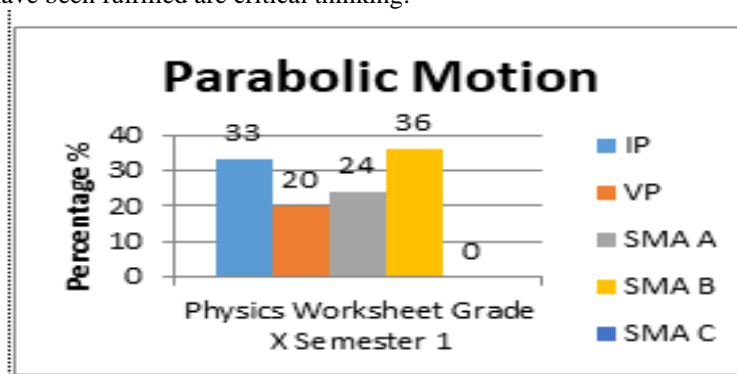


**Figure 4.** Percentage Average Score Availability of 21<sup>st</sup> Century Skills Indicators for Straight Motion

From the graph above, it can be seen that worksheet of IP got an average percentage score of 37% with the category less facilitating, worksheet of SMA A got an average score of 18% in the non-facilitating category, worksheet of SMA B got an average percentage score of 27% with the category lack of facilitation and worksheet of SMA C obtained an average score of 32% in the category of less facilitating, meanwhile there is no 21<sup>st</sup> century skills indicator found in worksheet of VP. Of the five worksheets analyzed, the 21st Century Skills indicator that most appeared for straight motion material was the IP worksheets with a percentage score of 37% in the category

of Less Facilitating. Compared to the other 3 worksheet, this worksheet together with SMA C has the advantage because it has met the critical thinking indicators with the same percentage, namely 78% with the category of facilitating. The worksheet with the lowest score was the worksheet of VP which was in the non-facilitating category because there was no availability of the 21<sup>st</sup> century skills indicator in this worksheet.

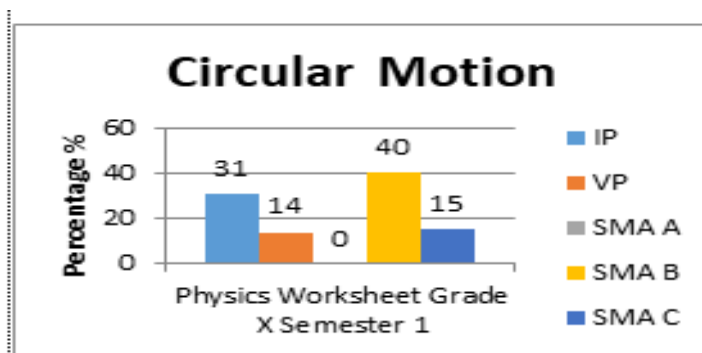
Based on the results of the analysis on straight motion material, the indicators of 21<sup>st</sup> Century Skills that are fulfilled in IP worksheets are indicators of critical thinking with the category of facilitating. Then for worksheet of VP, the indicators of 21<sup>st</sup> Century Skills that have been fulfilled are not found. For worksheet of SMA A, the indicators of 21<sup>st</sup> century Skills that have been fulfilled are communication indicators. worksheet of SMA B the indicators of communication are in the sufficiently facilitating category. For worksheet of SMA C the indicators of 21<sup>st</sup> century skills that have been fulfilled are critical thinking.



**Figure 5.** Percentage of Average Score Availability of 21<sup>st</sup> Century Skills Indicators on Parabolic Motion

From the graph above, it can be seen that worksheet of IP got an average percentage score of 33% with the category less facilitating, worksheet of VP got an average percentage score of 20% in the non-facilitating category, worksheet of SMA A got an average score of 24% with a sufficiently facilitating category, worksheet of SMA B obtained an average score of 36% with a sufficiently facilitating category, and worksheet of SMA C did not contain parabolic motion material in it. Of the five worksheets analyzed, the 21<sup>st</sup> century skills indicator that most appeared for parabolic motion material was worksheet of SMA A with a percentage score of 24% with the category of lack of facilitation. Compared to the other 4 worksheet, this worksheet has the advantage because it has met the indicators of critical thinking and communication indicators in the category of facilitating and highly facilitating. However, indicators for creative thinking have not been found in this worksheet. worksheet with the lowest score is worksheet of SMA C which is in the non-facilitating category because there is no availability of indicators for 21<sup>st</sup> century skills in it.

Based on the results of the analysis on parabolic motion material, the indicators of 21<sup>st</sup> century skills that are fulfilled in the IP worksheets are indicators of critical thinking and communication where the two indicators are sufficient to facilitate. Then for worksheet of VP, the indicator of 21<sup>st</sup> century skills that has been fulfilled is communication. For worksheet of SMA A, the indicators of 21<sup>st</sup> century skills that have been fulfilled are indicators of critical thinking and communication. worksheet of SMA B indicators that have been fulfilled think critically, think creatively and communicate in sufficient categories to facilitate the three indicators. For worksheet of SMA C, no indicators are met.



**Figure 6 .** Percentage Average Score Availability of 21<sup>st</sup> Century Skills Indicators on Circular Motion

In the graph above, it can be seen that the worksheet of IP obtained an average percentage score of 31% with the less facilitating category, the worksheet of VP obtained an average percentage score of 14% in the non-facilitating category, and the worksheet of SMA B obtained an average score of 40% with the poor category. facilitate. worksheet of SMA C has an average percentage score of 15% in the non-facilitating category. Meanwhile, circular motion material was not found in worksheet of SMA A. Of the five worksheets analyzed, the 21<sup>st</sup> century skills indicator that most appeared for circular motion material was worksheet of SMA B with a percentage score of 40% in the category of Less Facilitating. Compared to the other 4 worksheet, this worksheet has an advantage because it has met the indicators of critical thinking and communicating with the categories for each is facilitating by very facilitating.

#### IV. CONCLUSION

Based on the analysis worksheet whose fulfillment of 21<sup>st</sup> Century Skills indicators is the highest of the analyzed worksheets, namely worksheet of IP with a value of 37% (less facilitating) where the indicators that have been fulfilled in this worksheet are indicators of critical thinking with a sufficiently facilitating category and indicators with a sufficiently facilitating category. Meanwhile, the indicators that have not been fulfilled are collaborative skills and indicators of creative thinking in the less facilitating category. While the physics worksheets that get the percentage of indicator fulfillment on the lowest 21<sup>st</sup> Century Skills indicator are the worksheet published by Viva Pakarindo code (worksheet of VP) with a percentage of 12% (not facilitating). Where almost all 21<sup>st</sup> century skill indicators are in the non-facilitating category except for communication indicators. with the less facilitating category. Apart from that, there were still few questions in the HOTS category. From the analysis, it was found that the questions with the MOTS category which was at the C3 thinking level dominated the existing evaluation questions. Then followed by questions in the LOTS category and the ones with the least availability were questions in the HOTS category. Apart from that, for the types of questions, only questions with multiple choice types and essay questions found in the worksheets were analyzed. In addition, the worksheets have not included a variety of questions such as descriptions and true and false questions.

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