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Feasibility of Natural Indicators Worksheets for 11th grade Student

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Abstract
This study aims to determine the level of eligibility of worksheets for natural indicators of acid-base 11th grade Senior High School (SMA/MA) students in even semester. The population used in this study is a population sample consisting of six validators consisting of two content validator validators, two linguistic validator validators, and two graphic feasibility validators. Data collection instruments used were content eligibility questionnaire, linguistic feasibility questionnaire, and graphic eligibility questionnaire. The data analysis technique used is Gregory. Results Processing data in terms of content eligibility has a validity of 1 so that it has a very high level of content eligibility. For language eligibility, continued validity is obtained at 1 so that the level of language eligibility is also very high. However, the validity of the worthiness of the graphic is only 0.5 so that the level of feasibility of the graphic is still categorized as moderate. Thus, it can be concluded that LKPD of the natural indicators of acid-base for 11th grade students in even semester is feasible to be used in the learning process with very high criteria for content and linguistic aspects and moderate categories for graphic aspects.

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INTRODUCTION

Teaching materials or materials are one of the components in the learning system that plays an important role and helps students to achieve the goals as expected in the curriculum. In order to realise the implementation of a standard quality, effective, efficient, and relevant curriculum, as well as contributing and significant to the lives of future graduates, it is necessary to have some kind of module or book, guidelines, examples, or the like in terms of how the learning model and process is carried out according to the demands of the curriculum (Triyanto, 2009).

Ashadi (2009) defines chemistry as the study of the nature and composition of matter (which is composed of compounds) and its changes, how the compounds react or combine to form other compounds. Effendy (2010) defines chemistry as one of the branches of science related to the nature of matter, the structure of matter, changes in matter, laws and principles that describe changes in matter, as well as concepts and theories that interpret (explain) these changes.

Chemistry has several characteristics that distinguish it from other sciences. Middlecamp and Kean (1985) and Sastrawijaya (1988) suggested several characteristics of chemistry, namely: (a) most of chemistry is abstract (at the molecular or microscopic level), (b) the object studied is a simplification of the real thing, (c) chemical material is sequential and develops rapidly, and (d) not just solving problems consisting of numerical numbers.

Ben-Zvi et al., 1987, 1988; Johnstone, 1991, 1993; Nakhleh, 1992; Gabel, 1998, 1999; Treagust and Chittleborough, 2001 (in Chandrasegaran, et al., 2007) in their study concluded that the complexity and abstractness of chemistry makes chemistry a difficult subject for students to learn. Ashadi (2009) also mentioned that the characteristics of chemistry which mostly contain abstract concepts become a difficulty in learning chemistry. This is also in line with Gabel (in Chittleborough and Treagust, 2007) revealed that in chemistry there are many abstract concepts that are difficult for high school students to describe in a more concrete form.

Chemistry is a science that is built by thinking and experimenting which consists of the stages of observing, measuring, analysing, and drawing conclusions. Chemistry learning not only requires good academic skills, but also practical skills that can be implemented in everyday life (Juwairiah, 2015). Factors that affect student learning outcomes are internal factors of students, one of which is a scientific attitude that can be seen from practicum activities, so that they have a greater desire to seek information related to a problem related to learning material, so that the knowledge gained will increase (Lestari, 2014).

Teaching materials are part of learning resources. Teaching materials are all forms of materials used to assist teachers in carrying out teaching and learning activities. Teaching materials are a set of materials that are arranged systematically so as to create an environment/atmosphere that allows students to learn (Depdiknas, 2008). According to Gafur (2004) teaching materials are knowledge, skills and attitudes that must be taught by teachers and learnt by students (Suparmin and Desy, 2010). Mulyasa (2006) defines teaching materials as one part of learning resources that can be interpreted as something that contains learning messages, both specifically intended and general in nature that can be used for learning purposes (Suparmin and Desy, 2010).

Learning in practicum can run effectively by preparing a good source of learning materials and can motivate students to be able to understand the material contained in it regularly and systematically. Teaching materials are tools that can be used by teachers in the teaching and learning process, especially in conveying learning information about a material to students (Fitri and Ismulyati, 2016). One of them is printed media teaching materials such as Learner Worksheets (LKPD). LKPD is a source of supporting learning materials that can increase students' understanding of the chemical material they must understand (Seenam, 2008). LKPD is one of the learning resources that can be developed by teachers as facilitators in the learning process that allows students to participate in the learning process actively (Rohaeti, 2009).

Learner Worksheets (LKPD) are sheets containing tasks that must be done by students. Activity sheets are usually in the form of instructions, steps to complete a task. The task must be clear about the basic competencies to be achieved. While in Rozaliafransi's research (2015) that student worksheets are sheets containing tasks that must be done by students.

LKPD can function as a study guide to facilitate students and teachers in the learning process. LKPD is prepared using criteria that aim to attract the attention of students in learning activities (Noor, 2014). The general guidelines for the development of teaching materials prepared by the Ministry of Education and Culture (2008) explain that LKPD is a Learner activity sheet (Worksheet) which contains tasks that must be done by students both personally and in groups. Activity sheets are usually in the form of instructions or steps in completing each task and the steps used can train students to be able to solve problems. The preparation of LKPD includes several elements contained in it, namely title, basic competencies, supporting information, work steps, tasks, and assessments (Noor, 2014).

One of the effective teaching materials used in acid-base indicator material is natural material-based LKPD. The implementation of practicum related to the material taught in the classroom is not limited to the tools and materials available in the practicum, so special creativity is needed from the teacher in order to utilise the tools and materials available in nature (Juwairiah, 2015). One of the approaches included in Education for Sustainable Development (ESD) can be an option that can be applied in order to realise safe and environmentally friendly laboratory activities (Karpudewen, 2011).

The use of natural materials used as acid-base indicator paper aims to provide information to students about the use of natural materials, besides that indicator paper made from natural materials is easy to obtain, more effective, more efficient, and cheap to use (Lestari, 2016). The learning material for acambase indicators is related to natural indicators or natural dyes derived from natural materials. Certain dyes that can be used as alternative tissue dyes obtained from plant parts such as fruit, seeds, leaves, skin, or flower petals are called natural dyes (Noor, 2014).

Based on research conducted by Rohmah (2017), it is concluded that the application of practicum with an environmental approach for solution courses is stated to meet the aspects of instructions, content, and environmental approaches that are feasible to use as teaching materials in practicum in the laboratory because they obtain very good criteria. Another relevant research conducted by Pratiwi (2015) is the feasibility of LKPD as a learning media on the subject of buffer solution in 11^{th} grade of State Senior High School (SMAN) 1 Boyolali and SMAN 1 Teras.

Through student worksheets, it is hoped that it can help students to learn independently, because there are components such as brief material, student assignments, experimental procedures, as well as questions and exercises as discussion material. So that student worksheets are used as a means or reference for effective learning implementation. As part of teaching materials, the content of LKPD should be of high quality. However, in reality, LKPD is less standardised and the quality looks very poor. This has a negative impact on the learning process at school, which as a result, the desired results in the curriculum are not achieved (Anisah, 2013).

According to Diana Rosanti (2013) in research, there are at least four functions of LKPD as follows: as teaching materials that can minimise the role of educators, but activate students more; as teaching materials that make it easier for students to understand the material provided; as teaching materials that are concise and rich in tasks to practice; facilitate the implementation of teaching to students.

Teaching materials for Learner Worksheets (LKPD), are teaching materials that are simpler than modules. But more complex than books. Therefore, LKPD teaching materials have several elements including: Title, learning instructions, basic competencies or subject matter, supporting information, tasks or work steps, and assessment. Meanwhile, if we look at the format, in the research of Alvina Putri Purnama Sari et al (2015) that LKPD contains at least eight elements, namely title, competencies to be achieved, completion time, equipment or materials, brief information, work steps, tasks to be done, and reports to be done. These elements are needed for the preparation of teaching materials. Even with these elements we know what the composition of the Learner Worksheet looks like. Because these elements are very supportive in the Learner Worksheet.

The use of LKPD which was originally only as a guide for students in carrying out an activity or as a support, but now it is more widely used as the main guide. Teachers also sometimes use more student worksheets than certain handbooks during the learning process. As a result, many students think that just having LKPD is enough without reading handbooks or other

reading sources. Meanwhile, the learner worksheets used by teachers are not necessarily standardised in advance.

Nelly Dayanti et al (2019) have developed a student worksheet in participating in the competition. The LKPD contains practicum with acid-base natural indicator material for 11th grade of senior high school (SMA/MA) student in even semester. However, the LKPD developed has not been validated for feasibility. Whereas the LKPD should be validated first for its feasibility before being used by teachers at school. From these problems, the researcher is interested in conducting research with the title "Feasibility of Natural Indicators Worksheets for 11th grade Student".

METHOD

Form of Research

This research uses the development research method (Research and Development). According to Sugiyono (2010) the development research method is research used to produce certain products and test the effectiveness of these products. In this study, the development research design (Research & Development) was used to test the effectiveness of a product in the form of the feasibility of student worksheets that can be used as teaching materials in learning.

In this study, the feasibility of the Learner Worksheet will be assessed which includes:
1. Content Feasibility
2. Linguistic Feasibility
3. Graphic Feasibility

Research Population and Sample

Sugiyono (2006) defines population as objects or subjects that are in an area and fulfil certain conditions related to research problems. The population in this study were lecturers and teachers, each of whom numbered 3 people. So that the total population is 6 people. Because the population is only 6 people, the population used is a sample population.

Research Procedures

This research procedure was conducted as follows:
1. Preparation of the Assessment Instrument. At this stage, researchers used a validated feasibility assessment instrument. The instrument used came from Muhammad Nijam (2019) which was then adapted to the Learner Worksheet to be assessed.
2. Feasibility Test of LKPD. The feasibility test was carried out by one lecturer and one teacher for each aspect of the assessment. For content feasibility assessed by chemistry education lecturers and chemistry subject teachers. For linguistic feasibility assessed by language lecturers and Indonesian language subject teachers. And finally, the feasibility of graphics will be assessed by lecturers who are experts in the field and art subject teachers.

Data Analysis Technique

The validity technique used in this study is Gregory's content validation. According to Jesika Mosher (2011) to determine this validity coefficient, the results of the assessment of the two experts are entered into a 2x2 cross tabulation consisting of columns A, B, C, and D. After the items are validated, they are then analysed using calculations according to Gregory:

$$CV = \frac{D}{A+B+C+D}$$

Description:
CV = Content Validity
A = both validators disagree
B = validator 1 agrees, validator 2 disagrees
C = validator 1 disagrees, validator 2 agrees
D = both validators agree

The value of content validity can be seen as follows:
0 – 0.19 very low
0.2 – 0.39 low
0.4 – 0.59 medium
0.6 – 0.89 high
0.9 – 1.0 very high (Sugiyono, 2015).

RESULTS AND DISCUSSION

This research was conducted from 28 February 2020 to 5 March 2020 involving three lecturers and three teachers as validators. Each aspect was assessed by one teacher and one lecturer. For content feasibility, it was assessed by one lecturer of Chemistry Education FKIP Untan and one science teacher of SMP Negeri 16 Pontianak. For linguistic feasibility, it was assessed by one Open University Singkawang language lecturer and one SMP Negeri 7 Singkawang language teacher. The feasibility of graphics was assessed by one lecturer at the Singkawang Tarbiyah College and one art teacher at SMP Negeri 11 Pontanak. The research results are described in detail as follows.

Content Feasibility

The content feasibility assessment consists of 8 (eight) indicators, namely: 1) accuracy of the material, 2) activities that support the material, 3) currency of the material, 4) material stimulates students to find out, 5) local wisdom values in the material, 6) general presentation organisation, 7) general appearance, 8) completeness of LKPD. The complete content feasibility assessment can be seen in Table 1 (Depdiknas, 2008).

There are 13 (thirteen) aspects assessed in terms of content, namely: 1) contextual application in real life, 2) accuracy of terms, 3) practicum activities support the concept correctly, 4) evaluation questions support the concept correctly, 5) evaluation questions are equipped with an answer key, 6) the information presented is in accordance with the times, 7) invites students to be active in learning, 8) the material presented in the LKPD is equipped with local wisdom information related to learning indicators on acid-base material, 9) the presentation of material is systematic, logical, simple, and clear, 10) the design of LKPD is consistent, formatted, organized, and has appeal, 11) titles, images, and image captions in LKPD are in accordance with the concept, 12) the selection of colours, types and sizes of letters (fonts) is appropriate and easy to read, 13) LKPD is equipped with a cover, preface, KI, KD, competency achievement indicators, table of contents, summary, evaluation questions, bibliography (Depdiknas, 2008).

Content appropriateness was assessed by two validators. The first validator gave a score of 4 for all aspects. While the second validator also gave a score of 4 in almost every aspect, only two aspects were given a score of 3, namely aspects 11 and 12. Because the score given is the maximum score, the two validators also did not provide suggestions for improving the LKPD.

Table 1. Content feasibility assessment

Assessment Indicator	Assessment Item	Score			
		V1	V2	CV	Criteria
Accuracy of the material	Contextual application in real life	4	4	1	Very high
	Accuracy of terms	4	4	1	Very high
Activities that support the material	Practical activities support the concept correctly	4	4	1	Very high
	Evaluation questions support the concept correctly	4	4	1	Very high
	Evaluation questions are equipped with an answer key	4	4	1	Very high
Currency of the material	The information presented is in accordance with the times	4	4	1	Very high
Material stimulates students to find out	Inviting students to be active in learning	4	4	1	Very high
Local wisdom values in the material	The material presented in the LKPD is equipped with information about local wisdom related to learning indicators on Acid-Base material	4	4	1	Very high
General presentation organisation	Presentation of material is systematic, logical, simple, and clear	4	4	1	Very high
General appearance	LKPD design (consistent, formatted, organised, and attractive)	4	4	1	Very high
	The title, image, and image caption in the LKPD are in accordance with the concept	4	3	1	Very high
	The choice of colour, type and font size is appropriate and easy to read	4	3	1	Very high
Completeness of LKPD	LKPD is equipped with a cover, preface, KI, KD, Competency Achievement Indicators, table of contents, summary, evaluation questions, bibliography	4	4	1	Very high
Average Score				**1**	**Very high**

From the results of the average score for content feasibility, the result is 1.0 which shows the results of the validity assessment are very high. This is in line with the opinion of I Wayan Budiarta (2013) that the criteria of 0.8 - 1.0 have very high validity. Therefore, in terms of the content of LKPD Acid-Base Natural Indicators for 11^{th} grade of senior high school (SMA/MA) student in even semester has a high level of feasibility.

Asyar (2011) states that validation is the process of requesting approval or ratification of the suitability of the product to the needs so that the product is declared suitable and feasible for use in learning. In accordance with the opinion of Riti Desmiwati et al (2017) in their research on the validity of high school physics LKPD using a digital technology-based

problem-based learning model that one of the criteria for quality LKPD is LKPD has a high level of validity or validity. From this opinion, the high validation results can illustrate that the feasibility level of LKPD is also high.

Linguistic Feasibility

The assessment of linguistic feasibility consists of 4 (four) indicators, namely: 1) straightforward, 2) communicative, 3) dialogical and interactive, 4) suitability with students' development. The complete assessment of linguistic feasibility can be seen in Table 4.2 (Depdiknas, 2008).

Table 2. Linguistic feasibility assessment

Assessment Indicator	**Assessment Item**	**Score**			
		V1	**V2**	**CV**	**Criteria**
Straightforward	Accuracy of sentence structure	4	3	1	Very high
	Sentence effectiveness	4	3	1	Very high
	Term rigour	3	3	1	Very high
Communicative	Understanding of the message or information	4	4	1	Very high
Dialogical and interactive	Ability to motivate students	3	4	1	Very high
Suitability with students' development	Appropriateness to students' intellectual development	3	3	1	Very high
Average Score				**1**	**Very high**

There are 6 (six) aspects assessed in terms of language, namely: 1) sentence structure accuracy, 2) sentence effectiveness, 3) term rigour, 4) understanding of the message or information, 5) ability to motivate students, 6) suitability to students' intellectual development. The linguistic feasibility was assessed by two validators.

The first validator gave two improvement suggestions for the LKPD. The first suggestion was to put a comma after conjunctions between sentences such as the word but. The second suggestion is to change the punctuation mark (hyphen) which means up to to be a dash (─).

The second validator also gave two suggestions for the improvement of the assessed LKPD. The first suggestion should be after the conjunction but with a comma. The second suggestion should be a dash which means up to be replaced with a longer dash (─). These two suggestions will be input for future LKPD improvements to make it even better to be used in the learning process.

From the results of the average score for linguistic feasibility, the result is 1.0 which shows the results of the validity assessment are very high. This is also in line with the opinion of I Wayan Budiarta (2013) that the criteria of 0.8 - 1.0 have very high validity. Therefore, in terms of linguistic LKPD Acid-Base Natural Indicators for 11^{th} grade of senior high school (SMA/MA) student in even semester has a high level of feasibility (Depdiknas, 2008).

Graphic Feasibility

The assessment of the feasibility of graphics consists of 3 (three) indicators, namely: 1) use of fonts, 2) suitability of illustrations, 3) use of illustrations. The complete assessment of the feasibility of graphics can be seen in Table 4.3 (Depdiknas, 2008).

There are 6 (six) aspects assessed in terms of graphics, namely: 1) font type is appropriate and proportional, 2) font size is appropriate and proportional, 3) illustration is in accordance with the concept conveyed, 4) illustration facilitates understanding of the concept, 5) illustration colour is proportional, 6) illustration size is proportional (Depdiknas, 2008).

Table 3. Graphic feasibility assessment

Assessment Indicator	Assessment Item	Score			
		V1	V2	CV	Criteria
Use of fonts	The font type is appropriate and proportional	3	4	1	Very high
	Font size is appropriate and proportional	3	3	1	Very high
Suitability of illustrations	Illustrations are in accordance with the concept presented	1	3	0	Very low
	Illustrations facilitate understanding of concepts	2	3	0	Very low
Use of illustrations	Illustration colours are proportional	3	4	1	Very high
	Illustration size is proportional	2	4	0	Very low
Average Score				**0,5**	**Medium**

The feasibility of this graphic was assessed by two validators. The first validator gave an overall suggestion that the variety of images is too much so that the number of pages / sheets is thick with things that are not essential to the material. The second validator gave a lot of suggestions and details for the pages. The second validator's suggestions can be seen in figure 1 and Table 4.

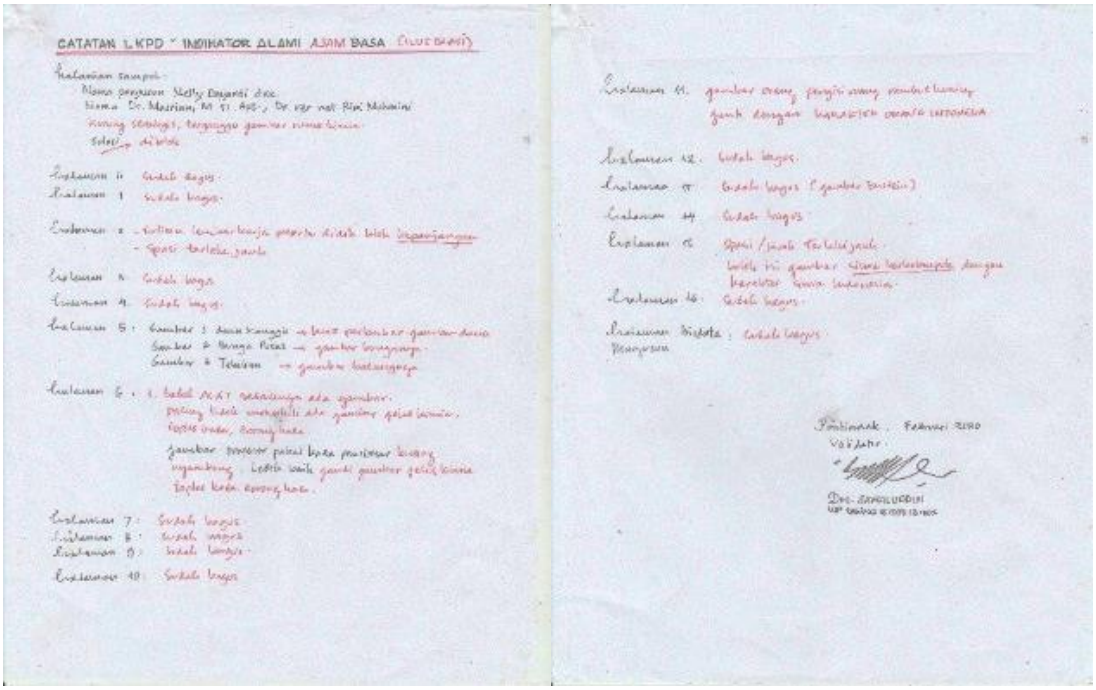

Figure 1. Second validator's suggestion for graphic feasibility

From the results of the average score for feasibility of kegrafikan obtained results 0.5 which indicates the results of the validity assessment are moderate. Therefore, in terms of graphic LKPD Acid-Base Natural Indicators 11th grade of senior high school (SMA/MA) student in even semester must be revised first before it is suitable for use.

For assessment item 1, both assessors have given scores of 3 and 4 so that the type of font used in the LKPD is appropriate and proportional. Likewise, for assessment item 2, both assessors gave a score of 3 so that the font size is also appropriate and proportional. So for the font usage assessment indicator, there is nothing to be improved.

Whereas in assessment item 3, the first rater only gave a score of 1 and the second rater gave a score of 3. Therefore, the illustrations used have not been in accordance with the concept to be conveyed. Likewise, with the assessment item 4 where the first rater gives a score of 2 and the second rater gives a score of 3 so that the illustration also has not facilitated the understanding of the concept. So for the illustration suitability assessment indicator must be improved first before the LKPD is suitable for use.

Table 4. Second validator's suggestions for graphics feasibility

Wrong part	Suggested Improvements
Cover	less strategic, the name of the author is disturbed by the picture of the chemical formula. The solution is blocked
Page 2	learner worksheet writing block length and bottom space too far away
Page 5	The picture is not clear because it is a picture of a tree, only the leaves and flowers should be shown so that it is clear
Page 6	the tool table should have a picture of the tool (such as a beaker) rather than a picture of the professor with a magnifying glass
Page 11	pictures of people filling the space yellow hair replace with Indonesian characters (such as black hair)
Page 15	space / distance too far. May be filled with pictures of students in groups with Indonesian student characters

Finally, on assessment item 5, both assessors have given scores of 3 and 4 so that the colour of the illustration is proportional. And for assessment item 6, the first rater only gives a score of 2 and the second rater gives a score of 4. Therefore, the size of the illustration is also not proportional. Where for the assessment indicators of the use of illustrations must be improved is the part of the illustration size assessment items.

For this feasibility, there is still a lot to be improved. This is indicated by the number of aspects given low scores by both validators. Likewise, the suggestions given show that it still has to be improved in the future. So the conclusion from the aspect of feasibility of graphics, LKPD still has a level of feasibility that is categorised as moderate.

CONCLUSION

Based on the results of research on the feasibility of worksheets for students of natural indicators of acid-base for 11^{th} grade of senior high school (SMA/MA) student in even semester, it can be concluded that in terms of content feasibility, worksheets for students have a very high level of feasibility. Likewise, the linguistic has a very high level of feasibility. However, the graphic feasibility of the worksheet of students of natural indicators of acid-base 11^{th} grade of senior high school (SMA/MA) student in even semester is still categorised as moderate so it is not yet suitable for use in the learning process.

RECOMMENDATIONS

Based on the results of data analysis and conclusions above, It can be suggest that the results of the assessment of the feasibility of graphics were obtained at 0.5 so that it is hoped that revisions can be made first to the feasibility of kegrafikan worksheets for students of natural

indicators of acid-base for 11th grade of senior high school (SMA/MA) student in even semester before it can be used in the learning process. The part of the illustration that must be improved is the suitability of the illustration with the concept conveyed and the suitability of the illustration in facilitating understanding of the concept and the size of the illustration that has not been proportional. It is hoped that there will be further research to improve deficiencies, especially in terms of grammatical feasibility so that worksheets for students of natural indicators of acid-base for 11th grade of senior high school (SMA/MA) student in even semester can be feasible for use in learning.

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