

INSTRUMENTS DEVELOPMENT FOR MEASURING STUDENT WORKSHEET MEDIA BASED ON SCIENTIFIC APPROACHES

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Abstract: Student Worksheets a media in the form of sheets containing tasks and activities that students must carry out, which are useful in supporting the learning process, one of which is in the material on the Structure and Function of Plant Tissues so that students can be active in the learning process. An assessment instrument is needed for the Student Worksheets. For this reason, this study aimed to measure the instrument's validity and reliability for using Student Worksheets as a learning media. This study used Research and Development (RND) methodology with an instrument in the form of a Student Worksheets measurement questionnaire consisting of three constructs: product design, material feasibility, and language feasibility. This research was carried out by involving seven teachers from several schools. Data were obtained by distributing the questionnaire via a Google form from September to October 2022 by obtaining prior consent from the respondents. The data obtained were quantitative, then analyzed using SPSS version 29 in the form of Alpha Cronbach analysis. The results of the test show that the validity of the instrument data meets the valid and reliable criteria with each Cronbach Alpha value per construct, namely Product Design (0.795), Material Feasibility (0.712), and Language Feasibility (0.712). Therefore, this study shows that the developed instrument meets the use requirements in developing Student Worksheets media students. Thus, stakeholders and teachers can use this instrument to develop media, particularly Student Worksheets, whereas further researchers can use this instrument to measure media before the study.

Keywords: *Student Worksheets, Validity, Reliability*

INTRODUCTION

Natural science is one of the subjects that students need to learn to help form intelligent, competitive, and skilled young people [1]. It follows the 2013 curriculum, which implements interactive, inspiring, fun, and challenging learning to increase student motivation and encourage them to participate actively during learning [2]. The application of the 2013 curriculum prioritizes scientific approaches that consist of observing, asking, trying, processing, presenting, concluding, and creating [3]. The 2013 curriculum wants students to learn independently to be literate in science and gain more meaningful learning experiences [4].

Natural science as a process has a role in achieving and developing knowledge in which students must be able to make something using scientifically controlled processes and principles. Material on the Structure and Function of Plant Tissues is one of the materials from the Biology subject. The Biology subject seeks to equip students with various abilities to understand concepts or facts in depth [5]. The problems experienced by students during learning cannot be separated from the role of teachers, one of which is in the use of learning tools, where students have yet to find or construct their knowledge about learning

material [6]. In addition, the problems that often occur in schools are Biology learning methods that use a lot of lectures [7].

Government Regulation of the Republic of Indonesia, Number 19 of 2005 Article 19 (1), states that the learning process in education units shall be carried out in an interactive, inspiring, fun, challenging, and motivating way for students to play an active role and provide sufficient space for their initiative, creativity, and independence according to their talents, interests, physical, and psychological development [9]. Education is important in improving human resources, where learning outcomes can be seen as a determinant towards a better education system. However, there is one factor that causes student learning outcomes to be low, which lies in the learning process [10]. Education must be carried out as well as possible. This can be achieved through timely education to realize learning objectives, manifested in the form of a learning process, which is the application of the school curriculum through teaching activities [11]. The most important point desired by every teacher is the achievement of learning objectives, so the teaching materials used have an important role [12]. Therefore, teachers must be more innovative when the learning process occurs or

when delivering material using learning media [13].

Learning media is a tool that has the function of explaining some parts of learning that are difficult to explain only verbally. Learning media is used so that students do not feel bored and can learn with enthusiasm. In line with that, learning media can be used as a channel for a message from teachers to students to foster thoughts, feelings, attention—and even willingness in the learning process, where learning media can be designed to complement the learning needs and abilities of students so that they can play an active role during learning [14]. One of the efforts that can be made to achieve the learning objectives properly and overcome student difficulties during the learning process is by providing Student Worksheets [15].

Student worksheet is one of the media that can be used to support the learning process. It is also one of the tools that can be used in explaining the learning materials so that students can play an active role [16]. Student worksheet is in the form of sheets containing assignments and activities that students must do. Student worksheet plays an important role in learning because it can help teachers develop student learning activities [17]. Thus, its use in natural science learning can help teachers guide students in discovering concepts through their activities [18]. Proper teacher supervision improves good relations between them and their students. Eventually, it will make it easier for students in the learning process. This student worksheet can be arranged according to the needs and competencies expected [19].

There are several benefits from student worksheet, including 1) making students active in the learning process; 2) assisting students in discovering concepts; 3) training students in improving process skills; 4) being used as a guide for teachers and students to carry out the learning process; 5) being used as an accompaniment of students to record materials learned through the learning activities, and 6) assisting students in looking up for information about the concepts being studied [20].

Based on the background explained, this study aimed to make an innovation in developing an assessment instrument for using student worksheet media based on Scientific Approaches. This study also facilitates students and teachers in the learning process so that it is not monotonous and boring.

RESEARCH METHODS

This study used Research and Development (RND) methodology [21] involving seven teachers from several schools. The instrument used consisted of 3 constructs with nine items: product design with five items, material feasibility with two

items, and language feasibility with two items [22]. Data were obtained by distributing the questionnaire online via a Google form to get responses from validators. The preparations made by researchers were to create the Google form, which validator experts filled in to obtain data included in this instrument development study to measure the use of student worksheet media. The process was carried out for two months by involving experts, namely teachers from several schools.

This study used the Dick and Carey development model [23], [24]. The Dick and Carey development model consists of 10 stages in designing a study in the development of student worksheet [25], including:

1. Identifying Instructional Objectives
First, planning and determining what students want—which can be described from objectives, learning analysis, needs assessment from practical experience, and student learning difficulties [26].
2. Conducting Instructional Analysis
Second, determining the knowledge, skills, and character students need to start instructional [27].
3. Analyzing Learners and Contexts
Then, an analysis of students was carried out—an analysis of where they learn and where they will use their knowledge (skills). Student choices were used to design instructional strategies. This analysis consists of situations regarding the skills learned by students and the conditions faced to apply the skills they have learned [28].
4. Writing (formulating) Performance Objectives
Performance objectives are derived from the skills identified in the instructional analysis, the skills to be learned, and the situations in which the skills are to be performed
5. Developing Assessment Instrument
This stage was to develop assessment items to measure student abilities as predicted by the objectives [29].
6. Developing Instructional Strategy
Sixth, prioritizing components to foster student learning, including pre-instructional activities, content presentation, student participation, assessment, and follow-up [30].
7. Developing and Selecting Instructional Materials
This stage was to develop materials, including modules, teacher guides, video CDs, computer-based multimedia, and web pages for distance/online instructional [31].
8. Designing and Carrying out Formative Evaluation
There are three types of formative assessment: one-on-one, small group, and field tests. Each type of assessment provides different

information for the designer to use in improving instruction. The same technique can be applied to the instructional or formative assessment of classroom materials.

9. Revising Instructional

This stage was to review so that all these considerations and assessments were attached to the instructional revision to create a better and more effective instructional tool.

10. Designing and carrying out Summative Evaluation

The results at the above stages were used as a basis for writing the required tool. The resulting tool was then validated, tested, or implemented in class with a summative evaluation [32].

The development model from the blueprints used a theoretical development model, namely a framework model based on relevant theory and supported by empirical data [33], [34]. This theoretical development model consists of several stages, namely carrying out theoretical studies in formulating constructs and indicators in assessing/evaluating the use of student worksheet media, making the blueprints of the instrument, making the items contained in the instrument, carrying out tryouts, carrying out revisions, analyzing, and formulating the resulted instrument from the study [35]. Each statement has five

answer items: a score of 1 to disagree strongly, a score of 2 to disagree, a score of 3 to agree somehow, a score of 4 to agree, and a score of 5 to agree strongly.

RESULTS AND DISCUSSION

Non-Test Instrument Validity

The preparation and method for developing an assessment instrument for using student worksheet media in this study were carried out using a theoretical development model. This study was carried out with the prefix of a theoretical study to formulate assessment constructs using student worksheet media [37]. Based on studies of various theories about the use of student worksheet media, there are three constructs for assessing the use of student worksheet media, namely 1) product design, 2) material feasibility, and 3) language feasibility.

Table 1. Blueprints of an assessment instrument for the use of student worksheet media

No	Name	Question Number
1	Product Design	1,2,3,4,5
2	Material Eligibility	6,7
3	Language Eligibility	8,9

Table 2. Instrument Validity

Construct	Item	Corrected item-total correlation	Cronbach's Alpha if Item Deleted
Product Design	Compatibility of color components on the student worksheet	0.511	0.785
	Accuracy of components on the student worksheet	0.835	0.744
	The student worksheet presentation is Interesting	0.336	0.807
	The student worksheet elements are Interesting	0.807	0.738
	Compatibility of the student worksheet with the selected learning model	0.940	0.718
Material Feasibility	Compatibility of the student worksheet with the selected material	0.344	0.815
	The material is easy to understand	0.417	0.750
Language Feasibility	The language used on the student worksheet is easy to understand	0.417	0.750
	The language used on the student worksheet is communicative and does not have a double meaning	0.344	0.815

Based on Table 1, it is shown that the number of statement items is nine items spread over three constructs. After researchers prepared the instrument blueprints for each contained in the construct, researchers then prepared the statement

items. After being prepared, the instrument was submitted to the validators for validation, where these validators were teachers from several schools.

A validity test is a measuring tool to measure what is to be measured—it is a test used to

see whether a measuring instrument is valid or not [38]. Each question item in an instrument is valid if the value of the r-count is greater than the r-table [39]. The results of the instrument validity test for each research data are presented in the following Table 2.

Based on Table 2, it is shown that the value of the r-count is greater than the r-table ($r\text{-count} > r\text{-table}$), so all items in the instrument can measure the assessment for the use of student worksheet media based on Scientific Approaches. The data that were obtained were then tested with a reliability test. From Table 2, researchers found that Cronbach's Alpha data exceeded the Corrected Item.

Non-Test Instrument Reliability

Each item was assessed in developing an assessment instrument for the use of student worksheet media. It was used to measure the extent to which items on the scale measure the same construct as other items on the same scale. Table 3 shows the reliability scale using Cronbach's Alpha coefficient for the questionnaire, which is based on the validation instrument for using student worksheet media for students.

Table 3. Cronbach's Alpha Reliability Index for Each Construct

Construct	Overall Cronbach's Alpha Score
Product Design	0.795
Material Eligibility	0.712
Language Eligibility	0.712

Based on the results of Table 3, Cronbach's Alpha Reliability Index values were obtained for each construct in this study, and the overall alpha values for 1) product design, 2) material feasibility, and 3) language feasibility components are 0.795, 0.712, and 0.712, respectively. An item is reliable if the alpha value is between $0.6 < X < 1$ [40]. Thus, the three constructs owned in this study have fulfilled the reliable requirements. Therefore these constructs can be used for further research needs [41].

A valid and reliable instrument was obtained based on the results of the validity and reliability tests of the assessment questionnaire for the use of student worksheet media. The results of this study are reinforced by previous studies stating that an assessment instrument that can be used is an instrument that meets the criteria, namely valid [42], [43]. In addition to meeting valid criteria, the instrument must also meet highly valid criteria. An eligible instrument is to be used in studies if it meets several conditions, namely validity, reliability, level of difficulty of the questions, and discriminating power [44].

Based on the analysis, a questionnaire that can be developed based on the assessment instrument for using student worksheet media for students has good construct validity and high reliability so that it can be used in further study, namely the development of student worksheet media [46]. Therefore, the instrument in this study to measure the assessment for the use of student worksheet media for students is considered feasible to use and can be trusted for use in studies that measure the assessment for the use of student worksheet media for students [47]. It is reinforced by previous studies stating that to ensure quality in research results, the instruments that can be used shall be derived from selecting valid and reliable tools [48]. Furthermore, use in assessment instruments must meet valid and eligible criteria [49]. With an assessment instrument for assessing/evaluating the use of student worksheet media for students, it can prevent speculative actions from teachers in making assessments, especially in determining the final grade after carrying out a study on assessment achievement for the use of student worksheet media for students.

CONCLUSION

From the results of this study, it can be concluded that the preparation and development of an assessment instrument for the use of student worksheet media for students used a theoretical development model to test three research constructs, namely, 1) product design, 2) material feasibility, and 3) language feasibility. The results of testing the construct validity and reliability show that the assessment instrument's validity for using student worksheet media for students meets the valid and reliable criteria. The assessment instrument for using student worksheet media for students that have been prepared and developed in this study fulfills the category indicated by Cronbach's alpha reliability coefficient, which is stated to be reliable because the numbers range from $0.6 < X < 1$. Therefore, this study shows that the developed instrument meets the requirements of use in developing student worksheet media for students. Thus, stakeholders and teachers can use this instrument in the development of media, particularly student worksheet, whereas further researchers can use this instrument in the measurement of media before carrying out the study.

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