Design Guided Discovery Student Worksheets To Construct The Understanding Of The Blind

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Abstract: Blind people are people who have limitations in their sense of sight or even have an inability to see. The research aims to design student worksheets based on Guided Discovery Learning to construct an angular understanding of blind students. The method used in this research is the ADDIE model. ADDIE consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The subject of this research is students of MTsLB/A Yaketunis Yogyakarta. Data collection instruments are a validation questionnaire, observation guidelines, and interview guidelines. The interview guide is conducted with teachers and students to find out the curriculum and student's characteristics. Data analysis technique use Miles and Hubberman models. The results of the study showed that students had difficulty in understanding mathematics. It was also found that students tended to memorize what was conveyed by the teacher. Blind students and teachers need student worksheet media that can help students understand, mathematical material that constructs angular learning understanding in blind students. The design of student worksheets that are produced based on Guided Discovery Learning is is following the students' characteristics, curriculum, and assignments of students. The result of this research is the design of student worksheets are feasible to develop to be a prototype.

Index Terms: Blind, ADDIE, Construct, Guided Discovery Learning, Understanding, Worksheet Development

1. INTRODUCTION

Blind people are people who have limitations in their sense of sight or even have an inability to see. The results of visual acuity with Snellen Chart, the world health organization (WHO) clarifies people's vision as "normal", "low vision", or "blind". When a child with normal vision can easily move in the environment and can imitate and see parents in the activities carried out. Blind children have limitations with a variety of things, therefore parents and teachers must know the characteristics of blind children [1]. Children with disabilities need special education with the child's own needs. Special education does not have to always be with a special class and classify children but rather to achieve the goals of education itself. There are many ways to do so to achieve learning goals for children and one of them is to modify learning and facilities and infrastructure that can support learning. Education for the visually impaired is very important because backwardness is not an obstacle for them to optimize their abilities in blind children [2]. In Indonesia, it has been trying to open access for people with special needs such as providing job training and developing services, but in reality, children with special needs have very little chance of schooling due to the limited number, facilities, educational facilities and infrastructure available [3]. The law states that citizens who have physical, emotional, mental, intellectual and/or social disorders have the right to receive special education. This further confirms that children with special needs have the right to obtain a proper education. Likewise with some of the policies of the Nations at the United Nations Convention on the Rights of the Child (1989), the UN Standards for Disabled Persons (1993) and Salamanca UNESCO (1994) Regulations emphasize that the right of all children to be respected equally, treated with respect and given opportunities the same in all things [4].

Children with special needs according to Heward are children with special characteristics that are different from normal children in general, including children who are blind, deaf, mental retardation, physical damage, sound disability, learning difficulties, disorders behavior, gifted children and children with health problems. Because the characteristics and constraints that they have for children with special needs require a form of educational services that are by their characteristics [5]. In the learning process, blind students also have limitations, namely inexperience (concept), the ability to move and interact with their environment, so that blind students tend to be hampered compared to normal students to visualize abstract things [6]. According to Thinus-Blanc and Garnet, it was shown that in teaching concepts to concrete objects, such as geometrical constructs on tunes, it took quite a long time to construct mental representations related to their spatial space, so that learning geometry had constraints on a teacher [7]. Learning for the blind is a learning process that is built to develop creative thinking that can improve students' thinking abilities, and can improve the ability to construct new knowledge to improve a good understanding of subject matter [8]. In the learning process, understanding concepts is very important according to NCTM, that indicators in understanding a mathematical concept are capable of "Recognizing the relationships between concepts and meanings of concepts, understanding concepts in different ways, communicating mathematics verbally and in writing, applying mathematics in real life and other situations, provide examples and not examples of a concept "then the ability to understand each indicator is scored according to criteria based on the rubric of assessment of understanding mathematical concepts [9]. The learning media in the learning process are also very helpful for students, as well as media Student Worksheets (LKS) as a means for students to help understand and learn the material and can be studied independently and LKS as an effective medium in learning because it is a very simple medium [10]. The method used by blind children is to have specificity in using learning media, media that can be reached by hearing and touching. Auxiliary media commonly used as a tape recorder while media which is used for touching is easy learning [11]. According to Permendikbud No.65 of 2013 stated that to strengthen the scientific approach needs to be applied research or discovery-based learning (discovery).
encourage the ability of students to produce contextual work, both individually and in groups, it is advisable to use a learning approach that produces project-based learning. The approach/learning model expected in the 2013 curriculum includes integrated thematic characteristics, scientific approach, discovery learning, problem-based learning and project-based learning [12]. Guided discovery learning students are given a problem to solve and the teacher provides guidance, direction, feedback, and examples to guide students in solving problems, so that guided discovery models can provide learning changes that were initially teacher-centered (teacher-centered) switch to centering in students (student-centered) [13]. Based on the results of observations and interviews conducted at MTsLB / A Yaketunis Yogyakarta, on September 25, 2018, until October 26, 2018, with Mathematics teacher Ms. Wahyu. Whereas the MTsLB / A Yaketunis using the 2013 curriculum. The learning resources used only to use books that have been provided by the education office. Likewise for other learning media that have not fulfilled, such as teaching aids and worksheets. Because of the constraints in writing specifically for blind students. The media used during learning is to use material summaries made by the teacher himself. Likewise, the students, especially those who have total blindness, have difficulty understanding one of the materials, namely geometry about knowing angles. Grade VII children in public schools are still lacking in understanding and recognizing wake according to their characteristics. This understanding is characterized by the ability to solve the questions given correctly and achieve minimum completeness criteria on mathematics subjects. Based on this, the authors designed mathematical LKS to construct the understanding of blind students in angular material to assist in the learning process of blind students to better understand angles.

2 METHODS
This type of research is R & D (Research and Development) research. The development procedure used in this study is the ADDIE model is composed of five process stages, namely: Analysis, Design, Development, Implementation, and Evaluation [14]. Visually the ADDIE stages can be seen in Figure 1.

This study includes analysis, design, development, implementation, and evaluation. After the analysis phase, then the design phase where the researcher makes the whole of the material to be conveyed. Then choose the optimal teaching method and create learning objectives that are useful and action-oriented to guide learning. After selecting the method then providing learning objectives in the design phase, the development phase consists of creating, and organizing the actual learning material that will be used during the teaching. Then implementation after analysis, design, and development, instructions must then be implemented or delivered. Final evaluation an important method for evaluating the effectiveness of education in a program is to objectively assess how well students gain knowledge, skills, or attitudes taught [16]. The sample is taken from the VIIIB class by involving teachers, students, material experts and media experts. The object of this research is data collection methods carried out in the study taken by giving tests and interview guidelines. The instrument of data collection is in the form of a validation questionnaire, observation guidelines, and interview guidelines. A validation questionnaire is addressed to material experts and media experts. The type of data produced is qualitative data in the form of the use of school curriculum, student characteristics, depth of material and input from media experts and material experts while quantitative data in the form of scores from the results of due diligence from material experts and media experts. The subjects in this study were seventh-grade students of MTs/LB in Yogyakarta. The data analysis technique in this study is data reduction [17]. Data obtained from observations and guidelines for interviews conducted in schools were then summarized and concluded. From the results of the analysis obtained a clear picture of the things that need to be done in the development of student worksheets that must be done. Namely data reduction, presentation, and conclusions.

3 DISCUSSION
This research uses the ADDIE model (Analysis, Design, Development or Production, Implementation or Deliver, and Evaluation), the first stage is defined to aim to analyze the learning conditions. The stages in the analysis include curriculum analysis, student analysis, material analysis, task analysis, and formulation of learning objectives [18]. In the initial analysis phase, the results obtained in the form of curriculum analysis of the sequence of mathematics subjects and angular material for class VII MTs/LB students who refer to the 2013 curriculum include identification of Core Competencies, Basic Competencies, subject matter, learning activities, assessment, time allocation, and learning resources used. The results of curriculum analysis are listed in the mathematics syllabus in the angular subject matter available in the 2013 curriculum. The basic competencies contained in the syllabus are translated into indicators of competency achievement. This indicator is a reference for the construction of LKS. The basic competencies found in the sequence and material in the series are in Table 1.
Table 1 Basic Competence

<table>
<thead>
<tr>
<th>No</th>
<th>Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.10</td>
<td>Analyze relationships between angles as a result of two parallel lines cut by a transverse line</td>
</tr>
<tr>
<td>4.10</td>
<td>Resolve problems related to relationships between angles as a result of two parallel lines cut by a transverse line</td>
</tr>
</tbody>
</table>

Based on Table 1 there are 2 basic components will be used in LKS construction. Next, student analysis is carried out. Based on the results of observations on the learning activities carried out in class VII MTs/LB students and interviews with teachers obtained from the results of the analysis of student characteristics, namely less. Confidence in blind students tends to hesitate to answer. Because basically, blind students cannot fully see the object given by the teacher. The ability to construct an understanding of material also needs to be improved. The second step in this stage is the design of the contents of the student worksheet. The contents of the student worksheets adjust the learning process according to the Guided Discovery Learning model. Guided Discovery Learning Steps can be seen in Table 2 as follows [19].

Guided Discovery Learning 2-step table

<table>
<thead>
<tr>
<th>No</th>
<th>Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Stimulus (giving stimulants)</td>
</tr>
<tr>
<td>2.</td>
<td>Problem statement (identifying problems)</td>
</tr>
<tr>
<td>3.</td>
<td>Data collection</td>
</tr>
<tr>
<td>4.</td>
<td>Data processing</td>
</tr>
<tr>
<td>5.</td>
<td>Verification</td>
</tr>
<tr>
<td>6.</td>
<td>Generalization</td>
</tr>
</tbody>
</table>

The second phase of the design, which aims to design the developed worksheet. The design stages include media selection, format selection, and initial design. Based on task analysis, concept analysis, and facilities available at the school, the selected media is student worksheets. The third step in this research is development. At this stage product development Student Worksheet according to the result of the previous step.

3.1 Cover LKS

The following view is about the initial design of guided discovery learning based worksheets in Figure 2.

3.2 Core Competencies (KI) and Basic Competencies (KD)

KI and KD contain indicators of what students must achieve when learning to use student worksheets. Core Competencies (KI) and Basic Competencies (KD) student worksheets can be seen in Figure 3.

Fig. 3 Core Competencies (KI) and Basic Competencies (KD)

3.3 Learning activities based on Guided Discovery Learning

Learning activities contain material, examples of questions and practices. Material is described so students can understand the material easily. Examples of problems given are adjusted to the steps of the Guided Discovery Learning and learning model and match the real world. Problems are given to determine the level of students' ability to understand the material provided, and as a benchmark for students' understanding of learning. Learning activities can be seen in the stages of Figures 4 and 5 bellow.

Fig. 4
The formation of sequential and series learning media development includes clarity of competency achievement indicators, by the student worksheets standards issued by the Ministry of National Education, student worksheets integrate indicators to construct understanding, and contains Guided Discovery Learning steps. The third stage of development is the realization phase of the worksheet and instrument design used to measure the performance of the product that has been developed. There are expert validation, media validation, and testing. At the expert validation stage, the assessment was conducted to determine the validity of the developed worksheet design. Students worksheets designs that have been approved by the supervisor are then validated by the validator, the material expert lecturer, media expert lecturer, and teacher. Student worksheet design validation uses assessment instruments that have been reviewed by lecturers, Mrs. Andriyani, M.Sc. and Class VII Teachers, Mrs.Wahyu, S.Pd. after valid instruments can be used by material experts and media experts to assess student worksheets to be developed. The following are some input and suggestions from material experts summarized in tables.

Table 3 Inputs and suggestions from experts

<table>
<thead>
<tr>
<th>Suggestions and Comments</th>
<th>Follow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add questions that are easy for students to understand</td>
<td>It has been fixed from the problem</td>
</tr>
<tr>
<td>Describe learning clearly</td>
<td>Description of learning has been added</td>
</tr>
</tbody>
</table>

Inputs and suggestions from experts were then revised. Furthermore, the feasibility of the learning material was assessed by three material experts. The following are the results of the questionnaire calculation regarding the feasibility of the design of instructional media by experts addressed in Table 4.

Table 4 Results of Calculation of Material Feasibility Questionnaire.

<table>
<thead>
<tr>
<th>No.</th>
<th>Appraisal</th>
<th>Position</th>
<th>Score</th>
<th>Criteria for Quantitative data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wahyu, S.Pd.</td>
<td>Teacher in Mathematics</td>
<td>18</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Based on table 4, it can be seen that the average score of this result indicates that the design of learning media developed in the category is very good. Media experts consist of two people, Dr. Andriyani, M.Sc. as an E-learning lecturer at the Postgraduate Mathematics Education Ahmad Dahlan University, Wahyu, S.Pd. as a seventh-grade math teacher MTsLB/A Yaketunis Yogyakarta. Student worksheets that have been validated by the validator and student worksheets revision will be done. The next step is increasing student worksheets. Furthermore, product and material development. The fifth stage is the evaluation. At this stage, the product that has been developed and has met the criteria for feasibility and effectiveness is revised based on expert suggestion.

4 CONCLUSION

Based on the description of student worksheets mathematics learning based on guided discovery learning, it has been carried out at the analysis and design stages. At the analysis stage, researchers grouped into 3 namely curriculum analysis, material analysis and analysis of student characteristics. In curriculum analysis, it was found that the curriculum used was the 2013 curriculum. In the material analysis, students experienced difficulties in the subject matter of the angle. And the last is the analysis of student characteristics, obtained that students tend to memorize by being conveyed by the teacher and need media that can help students understand the given mathematical material. At the design stage the researcher designed the initial worksheet, namely (covers, catalogs in chapters, glossary and bibliography). The development of constructing student understanding was found in problem training and evaluation. The development of student worksheets has advantages that can construct students’ understanding of the angles that are following the constructing indicators into the questions given. Development of a student worksheets based on Guided Discovery Learning to construct the understanding of seventh-grade students. This research can be developed at the stage of development, implementation, and evaluation to determine the feasibility and effectiveness of worksheets in the learning process.

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REFERENCES


