Student Learning Worksheet Design Based On STAD To Improve Mathematical Communication Skills

Yona Ayu Wardani, Suparman

Abstract:—This study aims to develop a worksheet based on student achievement (STAD) to improve mathematics communication skills of junior high school students especially in eighth grade. Communication skills are used to determine whether or not a student understands the material being taught. The Four-D Model used in this study with development procedures refers to four stages, namely: defining, designing, developing, and disseminating. This research was conducted on eighth grade junior high school students in Budi Mulia Dua, Indonesia. This research deals with curriculum, student characteristics, and evaluation of teaching materials. This research produces: a) the results of the analysis of the needs of student worksheets to improve students' mathematical communication skills in accordance with the curriculum, student characteristics, learning material, and learning objectives; b) the results of the students' worksheet designs consisting of covers, front pages, introductory words, table of contents, basic competencies, concept maps, supporting information, exercises, and answer sheets. This research can continue to be developed and disseminated.

Index Terms.—Student Worksheets, Mathematics Communication, Student Teams Achievement Divisions.

1 INTRODUCTION

Mathematical communication skills must be possessed by students [1]. Mathematical communication is the main key of students in formulating mathematical concepts and strategies and to explore scientific investigations which include finding, exchanging opinions, assessing, and sharpening ideas to convince others [2]. So that students' mathematical communication skills develop, students need to learn to communicate ideas about the mathematics materials provided [1]. Many studies in recent years have discussed the importance of the ideas that learners bring to lessons [3][4], besides the teacher's teaching methods and commitments also greatly influence [5] [6]. Stacey explained that communication skills are one of the factors that contribute to determining the success of students in solving problems [7]. Therefore, mathematical communication to be developed is important in middle school students in Indonesia. Cooperative learning techniques that are extensively studied and specifically assessed on academic achievement, attitudes, social interactions, and interpersonal relationships are Student Team Achievement Divisions (STAD) [8]. Cooperative learning is a group learning process to create active learning [9]. The tendency of cooperative learning was pioneered by colonel Francis Prker [10]. Cooperative learning can provide opportunities for students to discuss and help students develop social skills [11], in addition, students also have the responsibility of learning group buddies. At the same time, Robert Slavin from Johns Hopkins University in Baltimore has added several important elements in the process of structuring the group learning approach introduced by DeVries.

These changes leave a deep imprint for students, besides that according to Slavin, a cooperative approach requires students to work together with each other to learn. Students are also responsible for learning their group members and their own learning [12]. The student teams achievement divisions model has been applied in various themes in the fields of mathematics, linguistics, art, sociology, and science [13]. Student teams achievement divisions is an effective learning method in a classroom setting where students carry out learning activities as a team and receive awards and recognition based on their team's scores, besides student teams achievement divisions is one of the simplest cooperative learning methods [14]. According to Santyasa that "in project-based learning, projects are carried out collaboratively and innovatively, uniquely, focused on solving problems related to the lives of students". In addition, he must develop learning materials in the form of developing student worksheets [15]. Worksheets are defined as the fundamental tools containing required process steps and helping students to configure the knowledge and at the same time provide full participation of the entire class in the activities [16]. It has been also stated that worksheets provide guidance and offer solutions to problems [17]. The determination of the student worksheets which is this teaching material, is the variable that best fits the research. must be achieved by students.

2 RESEARCH METHOD

This type of research is development research. The product developed in this study is a student problem-based worksheet to improve students' mathematical communication skills. The research model uses the development of Four-D, to four stages, namely: defining, designing, developing, and disseminating [18]. The research subjects were class VIII students. The object of this research is curriculum, evaluation of teaching materials, and student characteristics. The instruments of data collection include observation guides, interview guides, and questions. Data analysis using Miles and Huberman which consists of data reduction, appearance, and conclusions in Figure 1 [19]. This research was carried out until the design stage.

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3 DISCUSSION
The development of this student worksheet using the Four-D development model starts with define. Based on the results of interviews with teachers, teachers only use book teaching materials that are used to provide questions to students. In the definition phase, it is indicated that it starts with (a) curriculum analysis, (b) analysis of student characteristics, (c) material analysis, (d) formulating objectives [20]. The curriculum used is the 2013 curriculum. Students need student worksheets with a format of difficulty levels from low to complicated and the language in the student worksheet is clear and easily understood by students and student worksheets with attractive appearance. At the definition stage, a compilation of indicators of achievement of competencies, analysis of material will be taught, and preparation of the objectives of junior high school mathematics learning in the eighth grade. The next stage is the design tab. This stage is done by designing a product in the form of workload of students in accordance with the results of analyses at the define stage. The student worksheet components are (a) cover, (b) front page, (c) introductory words, (d) table of contents, (e) basic competencies, (f) concept maps, (g) supporting information, (h) exercise, (i) answer sheet.

3.1 Figures
a. Cover
Student worksheet by title "Lembar Kerja Peserta Didik Matematika". The cover can be seen in Fig 2.

b. Front Page
The front page is the second page after the cover, given as in Fig 3.

c. Introductory Words
The introductory words serve to deliver the reader to the content or description contained in the student worksheets. Introduction can be seen in Fig 4.
d. Table of Contents
Table of contents is about the order of pages in a book. which can be seen in Fig 5.

Fig 4. Introductory Words

Fig 5. Table of Contents

f. Concept maps
Concept maps contain steps that must be achieved by students. Concept maps can be seen in Fig 7.

Fig 6. Basic Competent

Fig 7. Concept Maps

e. Basic Competent
Basic competency is the achievement of learning outcomes that must be achieved by students. Basic competencies can be seen in Fig 6.

g. Supporting Information
Supporting information is additional information that can complement students’ teaching materials. Supporting information can be seen in Fig 8.
h. Exercise
Exercise is a suggestion given to support the purpose of learning, which is to improve students’ mathematical communication skills. Exercise can be seen in Fig 9.

i. Answer Sheet
Group answer sheet and independent answer sheet. Which can be seen in Fig 10 and Fig 11.

4 CONCLUSION
This study resulted in the design of the students’ worksheet to improve mathematical communication skills with the student teams achievement divisions method. The results of the design are obtained by the components of the student worksheet student teams achievement divisions method. The results of the design
are obtained by the components of the student worksheet namely: (a) cover, (b) front page, (c) introduction, (d) table of contents, (e) basic competencies, (f) concept maps, (g) supporting information, (h) exercise, (i) answer sheet.

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