

Design of Mathematical Module Development Design of Learning Model *Number Head Together* to Improve Students Learning and Study Result

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Abstract: *The ability of collaboration is one of the important competencies that students must possess in learning 21st-century mathematics. Students who do not have the ability to cooperate will not get experience, can't develop themselves, and don't get new skills. This research has two objectives. First, this study is to analyze the needs of modules that are appropriate to the characteristics of students. Second, this research is to design modules that can enhance the ability of collaboration. This research is a research using Design Research Model which consists of two stages, namely the preliminary stage and the formative evaluation stage. The subjects of this study were teachers and students of class VII. Data collection instruments use validation sheets, interview guidelines, and questionnaires. Validation sheets are given to experts to obtain criticism and suggestions related to the material. Interview guidelines are used to obtain information on the condition of schools, students, and the media used in schools. The questionnaire is given to teachers and students to get criticisms and suggestions related to the media. Data analyzed using descriptive analysis. This study provides results that students and teachers need modules that are able to improve the ability of collaboration between students. This study concludes that the development of Number Head Together learning models assisted by mathematical modules to improve student collaboration on social arithmetic material needs to be developed.*

Keywords: *Module Development, Collaboration, Number Head Together*

INTRODUCTION

Development of the 21st Century requires the development of four students' abilities, one of which is the ability of collaboration. This is because the ability of collaboration is very important in life. The ability of collaboration is very important to be owned by everyone including students. Cooperation is a good ability to develop because in essence humans are individual beings and social beings who need each other (Norscia, Ivan & Palagi, Elisabetta, 2011). This collaboration is also a form of gaining experience, developing self-improvement by acquiring new knowledge and skills (Kamal, Sristi & Grodzinska-Jurczak, Malgorzata, 2014; Joan R. Rentsch, et al, 1994). The ability of collaboration is important in the process of learning mathematics (David. W Johnson, 2006; Sertel, Altun, 2018). However, in fact, based on observations at the Muhammadiyah Pleret and Muhammadiyah Middle School Banguntapan the learning practices carried out in schools so far there has been no teacher's effort to train students in collaborating during good mathematics lessons during discussions. For this reason, a new breakthrough step is needed to improve students' collaboration skills. Through collaboration students will gain experience, develop themselves, and gain new skills. This means that the ability of students to collaborate is important to develop. Strengthening the results of observations in the field is also seen in the results of research from MANCIU, Ionela, et al, 2018. This is in line with the results of research Sormunen's, Eero, et al, 2014 that low learning outcomes are influenced by low student collaboration.

Learning resources that can be developed by teachers to improve collaboration are modules (Singh, Charanjit Kaur Swaran, 2018). Modules can be interpreted as one source of learning that is systematically arranged in a language that is easily understood by students according to the level of ability of students with minimal guidance from the teacher (Maike, Wiesenfarth, 2018).

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The availability of modules can help students to obtain information about learning materials. So that the module can be developed systematically by the teacher as a source of student learning, the module provided by the teacher can also help students be more responsive in finding information about the material during the learning process in the classroom (Mohamed Hamada, Mohammed Hassan, 2017). To produce a good module and be able to improve student collaboration, the selection of learning models can help the use of modules used by students (Wiburg, K, 2017).

The accuracy of choosing a learning model in each teaching and learning process will determine the learning objectives that have been planned and the improvement of students' academic and non-academic abilities so that it will be followed by increased student collaboration and student creativity in learning (Cynthia O. Anhalt, 2017). In the 2013 curriculum, the suggested learning model is a learning model that is able to make students active in the learning process. In addition to the Minister of Education and Culture Regulation No. 65 of 2013 concerning Process Standards, it is stated that to strengthen the scientific approach it is necessary to apply to learn to the learning model. There are several types of cooperative learning models that can be used, one of which is the type cooperative learning model *Number Head Together* (Abdul, Hadi, 2017). The use of cooperative models can improve student learning outcomes (Soleimani, 2013). learning model *Number Head Together* is learning that begins with using *Numbering* because the teacher divides the small group then each group is numbered (Marleny Leasa, 2017). This learning model involves active students in learning. In addition, cooperative learning models prioritize cooperation in solving problems in achieving learning objectives. Several studies have shown that the development of assisted modules *Number Head Together* learning models can enhance student collaboration is the research of Dwi Mutia Chan, 2017.

In essence, the objectives to be achieved in this study are as follows. 1) To analyze the needs in the development of Class VII junior high school mathematics modules. 2) To stage the completion of the seventh-grade junior high school mathematics module based on the analysis of existing needs. This article has 4 parts, the first part is the introduction to the ability of collaboration, the preparation of a module assisted with learning model *Number Head Together*. The second part is the research method used in developing the seventh-grade junior high school mathematics module and the results and discussion in the third section. For the last section contains conclusions and implications of the articles that have been written.

RESEARCH METHODS

The research that will be carried out is development research or *development research* type *development study*. This study developed an assisted module on learning model *Number Head Together*. The research will be carried out on the mathematics learning an odd semester of 2018/2019 academic year. The stages of the research can be seen in Figure 1.

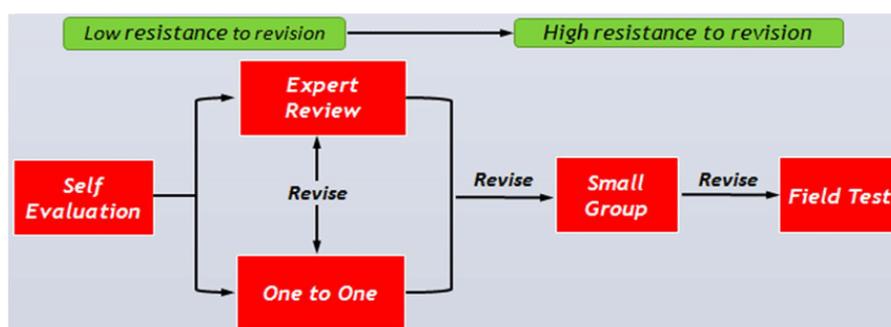


Figure 1. The design flow of formative evaluation (Tessmer, 1993)

The test subjects were seventh-grade students of Muhammadiyah Pleret Middle School and Muhammadiyah Middle School Banguntapan. Data collection instruments by meeting expert material experts, media to validate the module to be made. In addition, the instrument is in the form of interview guidelines, and guidelines for observing collaboration capabilities. Interview guidelines are conducted by researchers to teachers and students to explore their opinions on the modules developed. Guidelines for collaborative ability observation are used to see the potential effects of the modules that have been made on students' collaboration skills, carried out by giving questions and working in groups. The data was then analyzed using the technique *Miles Huberman* which consisted of data reduction, data display and conclusion drawing.

RESULTS AND DISCUSSION

The development of this module uses Research research methods *Design* Referring to Tessemer (in Putri, R. I, 2013) this research was conducted in two stages, namely The *Preliminary Study* phase includes the analysis phase, the design and *Formative Evaluation* stages including the stages of *self-evaluation*, *expert review*, *one to one*, *small group* and *field test*. In this research phase has been carried out *Preliminary*. stages *Preliminary* that has been done are up to the stage of analysis and design.

Analysis Phase, at this stage the researcher carried out several analyzes namely student analysis, curriculum analysis, and content analysis.

First, students' analysis was conducted to obtain information that the research subjects in the stage *one-to-one* were 3 grade VII students of Muhammadiyah Pleret Middle School. Furthermore, the research subjects in the stage *small group* were sixth grade students of Muhammadiyah Pleret Middle School as many as 6 students, while the stage of *Field Test* the research subjects were seventh grade students of Muhammadiyah Pleret Middle School as many as 32 students with heterogeneous ability levels, ranging from students who had low, medium, and to high.

Second, curriculum analysis is carried out to analyze KI and KD social arithmetic material in the 2013 curriculum and the results of the analysis can be seen in Figure 1.



KOMPETENSI	
Kompetensi Dasar	Indikator Pencapaian Kompetensi
3.11 Menganalisis aritmetika sosial (penjualan, pembelian, potongan, keuntungan, kerugian, bunga tunggal, persentase: bruto, neto, tara)	3.11.1 Menentukan Keuntungan Dan Kerugian 3.11.2 Menentukan Diskon 3.11.3 Menentukan Bruto, Neto, Tara 3.11.4 Menentukan Bunga Tunggal 3.11.5 Menentukan Pajak
4.11 Menyelesaikan masalah berkaitan dengan aritmetika sosial (penjualan, pembelian, potongan, keuntungan, kerugian, bunga tunggal, persentase: bruto, neto, tara)	4.11.1 Menyelesaikan permasalahan berkaitan dengan harga penjualan, pembelian, Keuntungan Dan Kerugian 4.11.2 Menyelesaikan permasalahan berkaitan dengan Diskon, Bruto, Neto, Tara 4.11.3 Menyelesaikan permasalahan berkaitan dengan Bunga Tunggal, Pajak

Figure 1. Results of KI and KD analysis of social arithmetic materials

Third, content analysis is carried out by analyzing the needs of the modules to be compiled. The three analyzes conducted aimed to determine the needs of students, teachers, and schools related to the appropriate modules used in the process of learning mathematics. In addition to this, an analysis is carried out to determine students' difficulties in mathematics learning so that it can be improved by developing modules based on appropriate learning methods.

Design phase, at this stage the researcher uses a mathematical module assisted by learning model *Number Head Together* to be created. Selection of the module development format

through the right steps. This initial draft was the first draft which was still in the form of a prototype which would later be validated by experts.

There are several characteristics of math module assisted by learning model *Number Head Together* will be designed with attention to several things, namely module cover, module identity page, preface, module contents list, background, brief description, module prerequisites, module usage instructions, KI and KD, module concept map, module material, sample questions and practice questions.

First, the cover of the mathematics module is titled “Mathematical Module Assisted with model *Number Head Together*”. In order for this module to be easily recognizable, the cover is written with an identifier such as “Class VII Mathematics / MTs Mathematics Module 2013 Curriculum by Ika Putri Astriyana Sari, S.Pd”.

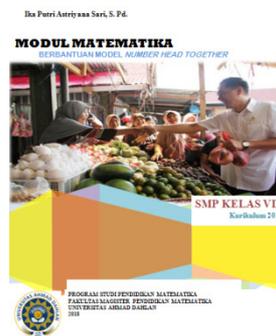


Figure 2. Mathematical Module Cover Design

Second, the module identity page consists of module titles, authors, mentors, and validators. For module specifications also written cover design, software, and paper size.



Figure 3. Design of the module Information Page

Third, the introduction of this module is made to say thank you for the strength of this module.



Figure 7. Module Concept Map Design

*Eighth, the material in this module is packaged in such a way as to produce a mathematical module that can be used in the learning process carried out in the class assisted by learning model *Number Head Together*. In the material contained in this module, students are expected to be able to increase collaboration and student learning outcomes in arithmetic materials.*

Ninth, the example problem serves to facilitate students in learning this module given examples of questions that are in accordance with the arithmetic material. Practice questions are arranged to find out students' level of understanding.

CONCLUSION

The development of a math module assisted by learning model *Number Head Together* was developed using a research research model *design type development studies*. The steps are in the form of a *Preliminary Study* phase which includes the analysis and design stages. In this research phase has been carried out *Preliminary*. stages *Preliminary* that has been done are up to the stage of analysis and design. For the next stage, it can be continued by doing the stages of *self-evaluation, expert review, one to one, small group* and *field test* to determine the potential effects of the modules compiled, so that it can be seen that the students' ability to work in class VII.

In the analysis phase, the researcher has carried out several analyzes namely student analysis, curriculum analysis, and content analysis. The three analyzes conducted aimed to determine the needs of students, teachers, and schools related to the appropriate modules used in the process of learning mathematics. In addition to this, an analysis is carried out to determine students' difficulties in mathematics learning so that it can be improved by developing modules based on appropriate learning methods. At the design, stage researchers have selected the format of the module development through the right steps. This initial draft was the first draft which was still in the form of a prototype which would later be validated by experts. The purpose of selecting the module development format is to produce mathematical modules that are suitable for use by students in the learning process.

This research can be further developed at the validation stage so that a math module assisted by Learning Model *Number Head Together* can which can enhance collaboration and student learning outcomes.

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