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# DEVELOPMENT OF STAD-TYPE COOPERATIVE MODEL TEACHING MATERIALS WITH THE BLENDED LEARNING METHOD ON MATERIAL SYSTEM OF LINEAR EQUATIONS

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***Abstract***
Learning and teaching materials are two things that complement each other. Learning will work if equipped with teaching materials such as textbooks and LKM. The learning process must be able to increase the independence and creativity of students so that their skills are more focused and produce output that is ready to face challenges in the 21st century. Alternative 21st century learning methods that are appropriate to use are blended learning methods. The implementation of the blended learning method will work effectively if it is equipped with teaching materials such as textbooks and LKM as reference materials for students in learning. Therefore, in this study developed cooperative model STAD type teaching materials with the blended learning method. The method used in this research is Nieveen's (1999) development method which includes the initial investigation stage, the prototype stage, and the assessment stage. The results of the development showed that: (1) the expert's assessment of the STAD cooperative model teaching materials (textbooks and LKM) with the blended learning method was feasible to use, (2) the trial results of the STAD cooperative model teaching materials with the blended learning method were practically used by lecturers and students in learning and effective for students mastering the material system of linear equations.

Keywords : Teaching Materials, *Blended Learning*, dan Model Kooperatif Tipe STAD.

## INTRODUCTION

The complexity of education in life and competition in the 21st century has created new challenges for the world of education. Global education responds by making 21st Century Skills which consist of three major components, namely thinking, acting, and living in the World as a challenge in global education (Greenstein, 2012).

One of the main foundations for various aspects of life in the 21st century is the era of the industrial revolution 4.0 which is marked by the use of technology, communication and information which are applied to everyday life and become the basis of human life. This makes the State prepare graduates who are qualified and able to compete globally, and master technological developments (Kanematsu & M. Barry in Khasanah, 2019). Thus the support and role of education is expected to form educated human beings through improving the quality and competence of human resources who are increasingly competitive in dealing with developments in information technology. This is in line with the mandate of Law Number 20 of 2003 concerning the National Education System which states that educated people are people who believe in and are devoted to God Almighty, have noble character, are healthy, qualified, capable, creative, independent, and become good citizens. democratic and responsible. In efforts to achieve this goal, it is necessary to develop an independent

learning society at every level of the educational unit, including in tertiary institutions (Ministry of National Education, 2007). This means that educational programs in each study program in tertiary institutions must be able to develop students' knowledge, attitudes, and skills in order to be able to solve a problem.

The tendency for a shift in patterns of learning mathematics from conventional patterns or traditional patterns to modern patterns mediated by Information and Communication Technology (ICT) is a challenge for lecturers to design and develop teaching materials as well as strategies and approaches to learning mathematics. According to Rosenberg & Marc (2001) there are three shifts in the learning process due to developments in technology and information, namely: a) a shift from classrooms anywhere and anytime, b) a shift from paper to online, and c) a shift from physical facilities to network facilities. . With the development of information technology, lecturers can provide services or facilitate without having to deal directly with students, as well as students can obtain information in a broad scope from various sources through virtual space using computers or the internet.

Answering the various challenges above requires a mathematics teaching material that is able to motivate and improve students' ability to solve a problem. One of the teaching materials in question is STAD cooperative model teaching materials with the blended learning method. This teaching material combines teaching materials for face-to-face learning in classrooms and e-learning learning. This integration was developed with the aim of bridging the rapid flow of electronic learning resources (e-learning) and the difficulty of breaking away from the use of mathematics teaching materials used in traditional classrooms. One of the learning that combines face-to-face learning in class with online learning is the blended learning method. Blended learning is needed when the existing situation demands a combination or mixing of various learning environments to achieve learning goals. For example, when distance learning is not really needed, face-to-face learning is needed. This blended learning learning process is needed for students who need additions and combinations in learning.

The integration of the two learning models is very commonly used in various countries, including Indonesia. It's just that the application of the blended learning method in higher education in Indonesia has not been designed in such a way. In terms of blended learning is an effective solution in efforts to improve learning because, according to Lewis (2002), one thing that needs to be emphasized and understood is that e-learning cannot completely replace conventional learning activities in class. E-learning can be a partner or complementary to conventional learning in the classroom. E-learning can even be a great complement to classroom learning models or as a powerful tool for enrichment programs.

The development of teaching materials in this study was based on the STAD type cooperative model with the blended learning method. According to Slavin (2005), STAD is one of the simplest cooperative learning models, and the best model for beginners for lecturers who are just using the STAD cooperative model. Cooperative learning consists of an instruction cycle of regular activities with five major components namely class presentations, team work of four or five students, quizzes, individual progress scores, and team rewards. The development of teaching materials using the STAD type of cooperative learning model is very appropriate for use by lecturers to improve learning in class and via the internet (online). This is because the STAD type of cooperative model teaching materials emphasizes the results of collective achievement in groups as explained by Slavin (2010), that in cooperative learning students will find it easier to find concepts and understand difficult concepts more easily if they can discuss them. problems with the group both in class and via the internet.

The achievement of STAD type cooperative model teaching materials will be meaningful for students if their development is based on integrating classroom learning and e-learning which is called blended learning. Blended learning combines the best features of in-class face-to-face learning and the best features of online learning to enhance students' active independent learning and reduce

the amount of face-to-face time in class. For example, many lecturers report that through blended learning students can be more successful in achieving course objectives than traditional learning. Another lecturer reported an increase in interaction and contact between students and between students and lecturers. The main advantage is the flexibility of time for students. Many lecturers feel that their students actually learn more in blended learning than in traditional classes. There are even lecturers who report that students write better papers, do better tests, do better quality projects, and can carry out discussions more meaningfully (Yaumi, 2017).

Implementation of mathematics teaching materials using the blended learning method is the right solution to increase the frequency of direct contact between fellow students and between students and resource persons or lecturers in the learning process both in class and online (e-learning). This is in accordance with the opinion of Yusuf (2011) that sooner or later the blended learning method will replace the traditional learning model because there is a double acceleration in the way students interact with lecturers or with other students to meet their needs.

Based on the description above, the authors are encouraged to develop teaching materials for the STAD type cooperative model using the blended learning method. The development of this teaching material uses the Nieveen model which has been modified as needed to produce valid, practical and effective teaching materials. The components in this teaching material include subject matter, learning outcomes, material descriptions, material summaries, exercises, quizzes, and formative tests. The construction of these teaching materials is built on the basis of suitability considerations from the results of the comparison of references studied before carrying out development. That is, this construction is considered based on an analysis of the needs of teaching materials for the Linear Algebra course, especially for material on systems of linear equations that can combine printed and non-printed sources or materials. In addition, the priority of this teaching material is to make it easier for lecturers to control students when to study outside class hours. This mathematics teaching material was also developed as an alternative to answer the challenges for lecturers in integrating face-to-face learning and online learning.
Based on the background of the problems above, the problem formulated in this study is: "How to develop teaching materials for STAD type cooperative models with the blended learning method that meet valid, practical, and effective criteria on the subject of systems of linear equations?"

## RESEARCH METHODS

### Development Procedure

This research is classified as development research or ”Research & Development. The development of teaching materials is carried out by designing and modifying the Nieveen (2010) development model into 3 stages, namely the initial investigation stage, the prototype stage, and the assessment stage.

1. **Initial Investigation Stage (Preliminary Research)**

Activities carried out at this stage are conducting problem analysis, gathering information about materials and needs, and learning tools used by lecturers in the learning process. To achieve this goal, pre-survey activities were carried out in the field (giving questionnaires, conducting interviews, and teaching materials used by lecturers in the learning process in class), literature studies, and reviewing research results which formed the background to the research being carried out. The information obtained from the results of the analysis is used as material for designing product development, namely teaching materials for the STAD type cooperative model with the blended learning method and instruments for assessing product quality.

2. **Prototype Stage**

At this stage an initial draft of teaching materials was designed, namely textbooks, LKM, and product development quality assessment instruments. The teaching material intended in this

study is the STAD type cooperative model teaching material with the blended learning method on the material system of linear equations. The components of these teaching materials include: learning outcomes, subject matter, material descriptions, material summaries, exercises, quizzes, assignments, and formative tests. In addition, the tasks that will be carried out by students in the teaching materials are also developed. The design of this teaching material is hereinafter referred to as Prototype 1 of the STAD cooperative model teaching material with the blended learning method.

Furthermore, to assess the quality of the developed teaching materials, a teaching material quality instrument is needed, including validity, practicality and effectiveness instruments. The instrument designed at this stage is called Prototype 1 Teaching Materials Quality Instrument.

**3. Assessment Stage**

The product produced at the prototype stage was then assessed for validity by two experts to obtain suggestions and improvements to the teaching materials and assessment instruments used in this study. The results of this validity evaluation are called Prototype 2.

Furthermore, the resulting prototype 2 was tested through face-to-face learning in class and online learning. The aim is to find out the practicality and effectiveness of the implementation and use of product development in the field. The trial results were analyzed. If the results of the product analysis data meet the practicality and effectiveness criteria, then the resulting prototype is the final product. If the results of the analysis show that the practicality and effectiveness criteria have not been met, then a product revision is carried out. The revised results must be tested again to obtain a revised product that is practical and effective.

**Research subject**

This research was carried out at the UKI Toraja Mathematics Education Study Program, so that the subjects of this research were 2 lecturers and 12 students who programmed the linear algebra course in the Mathematics Education Study Program class of 2019/2020.

**Data Collection Techniques and Instruments**

Data collection techniques used in this study are observation techniques, questionnaires and tests. While the instruments used include: (1) teaching material validation validation sheets, (2) implementation observation sheets and student activity observation sheets to assess the practicality of teaching materials, (3) lecturer and student response questionnaires to assess the practicality of teaching materials, and (4) material mastery test to assess the effectiveness of teaching materials.

**Data analysis technique**

**1. Validity analysis**

The validity analysis technique used is qualitative and quantitative analysis. Qualitatively, it is done by asking for expert consideration to provide an assessment and provide suggestions for direct improvement to the teaching materials being developed. Meanwhile, in quantitative analysis, the validity of teaching materials is measured by content validity, namely face validity and logical validity (Allen & Yen, 1979).

The validation score obtained is then converted into qualitative criteria. The assessment categorization refers to the categorization by Azwar (2013) as Table 1.

Table 1. Category validation of teaching materials

| Interval Skor | Kategori |
|---|---|
| M = 5 | Very Valid |
| 4 ≤ M < 5 | Valid |
| 3 ≤ M < 4 | Quite Valid |
| 2 ≤ M < 3 | Less Valid |
| 1 ≤ M < 2 | InValid |

**1. Analysis of the level of practicality of teaching materials**

The practicality of the developed teaching materials is measured based on the results of data analysis such as: (1) observational data on the implementation of teaching materials, (2) student activity data during learning, and (3) practicality data from lecturers and students on teaching materials carried out through face-to-face learning and online learning.

**a. Analysis of the implementation of learning**

Data from the observations of two observers in the form of a score added together becomes the actual score of the implementation of learning. The actual score obtained is converted into the practical value category of implementing teaching materials in learning as in Table 2..

Table 2. The practicality value category of the implementation of teaching materials

| Score Intervals | Category |
|---|---|
| 80 < X ≤ 100 | Very Practice |
| 66,67 < X ≤ 80 | Practice |
| 53,34 < X ≤ 66,67 | Quite Practice |
| 40,01 < X ≤ 53,34 | Less Practice |
| 20 < X ≤ 40,01 | Impractical |

Source: Azwar (2010)

The implementation of teaching materials is said to be practical, if the results of observations from observers show that the actual score (X) is at least in the practical category.

**Analysis of student activity data in learning**

Data from the observations of two observers about student activity in learning is calculated by percentage. The score obtained is then converted into student activity categories for each aspect or overall student activity in learning as quoted from Karuru (2004) as in Table 3

.

Table 3. Categories of student activity

| Score Intervals | Category |
|---|---|
| 80% ≤ AV ≤ 100% | Very active |
| 60% ≤ AV < 80% | Active |
| 40% ≤ AV < 60% | Less Active |
| AV < 40% | Not active |

AV = average student activity in learning

Teaching materials that are developed are said to practically involve students actively, if teaching materials have an average minimum percentage in the "active" category.

**Analysis of the level of practicality of teaching materials from the assessment of lecturers and students**

The practicality of teaching materials is also measured based on the results of lecturers' and students' assessments of the ease of applying STAD type cooperative teaching materials with the blended learning method in learning. The scores obtained from practicality questionnaires from lecturers and students are then added up to become the actual score (X). The practicality categories of lecturer and student assessments can be seen in Table 4.

Tabel 4. Kategori nilai kepraktisan dari dosen

| Score Intervals | Category |
|---|---|
| 76,0 < X ≤ 95 | Very Practice |
| 63,3 < X ≤ 76,0 | Practice |
| 50,7 < X ≤ 63,3 | Quite Practice |
| 38,0 < X ≤ 50,7 | Less Practice |
| 19 < X ≤ 38,0 | Impractical |

The lesson material developed is said to be practical, if the assessment from lecturers and students shows the actual score (X) is at least in the "practical" category.

**1. Analysis of the level of effectiveness of raw materials**

The effectiveness of teaching materials is measured from the learning achievement test data (THB). THB is used to determine student mastery of the material as measured by the learning outcomes that have been formulated. Giving scores using a free scale, depending on the weight of each item about. The total score obtained by each student in implementing THB at the end of the meeting is data on student learning outcomes.

Furthermore, to see the categorization of scores, the effectiveness categorization reference according to Masyhud (2012) is used as shown in Table 5.

Table 5. Category of the effectiveness of teaching materials

| Score Intervals | Category |
|---|---|
| 81 – 100 | Very Good |
| 71 – 80 | Good |
| 61 – 70 | Quite Good |
| 51 - 60 | Less Good |
| 0 ≤ 50 | Not good |

The teaching materials developed are said to be effective, if student learning outcomes tests show a minimal average score in the "good" category.

## RESEARCH RESULTS AND DISCUSSION

### Research result

The teaching materials developed in this study are STAD cooperative model teaching materials with the blended learning method in the form of textbooks and LKM which contain material and assignments that will be studied and completed by students, so that students can easily find the concept of a system of linear equations. The results obtained from each phase are described as follows.

1. Initial Investigation Phase

The activities carried out in this phase were analyzing problems and analyzing the needs of teaching materials in the UKI Toraja Mathematics Education Study Program which included curriculum analysis, material analysis, student analysis, task analysis, and learning achievement analysis.

**a. Curriculum analysis**

The activities carried out at this stage are: (1) reviewing the curriculum, (2) identifying learning administration, (3) identifying learning processes, and (4) identifying student learning outcomes. The results of the curriculum analysis obtained an overview of the importance of developing teaching materials for Linear Algebra courses, especially material for systems of linear equations in accordance with learning theory, challenges, and future demands, especially related to Independent Learning on the Independent Campus (MBKM). Observations and surveys were also carried out to look for fundamental problems that hinder the development of teaching materials to improve students' mastery of the material on systems of linear equations.

b. **Student analysis**
The activities carried out at this stage are analyzing students' prior knowledge about the material for systems of linear equations, and observing student activities in face-to-face learning and online learning. The results of the analysis show that it is necessary to develop teaching materials that enable students to be able to construct their own knowledge about systems of linear equations material by relating their prior knowledge. In addition, direct observations were also made in learning and the results revealed that there were still many students who were not actively involved in both face-to-face and online learning. The results of this analysis form the basis for the importance of developing a STAD-type cooperative teaching material so that students are able to develop their potential in constructing teaching materials through blended learning.

**c. Material analysis**
The activities carried out at this stage are identifying teaching materials, compiling them hierarchically, and sorting individual materials so that they can be categorized as critical material and irrelevant material. In this study the material chosen was a system of linear equations with reference to the Independent Campus Learning Curriculum (MBKM).

**d. Task analysis**
At this stage the writer identifies the main skills needed and analyzes them into a framework of sub-skills. This is used as a basis for compiling tasks that must be carried out and completed by students in learning with the blended learning method. The skills carried out by students are "able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing a system of linear equations".

**e. Learning Outcomes**
The final learning outcomes that were formulated based on material analysis and task analysis as a basis for designing teaching materials and learning achievement tests were that students were able to: (1) write down the form of a system of linear equations and their arrangement; (2) determine the solution to a system of linear equations with one variable, two variables and three variables; (3) write down the general form of a system of homogeneous and non-homogeneous linear equations; and (4) determine the completion of homogeneous and nonhomogeneous linear equations using Cramer's method, OBE method, Gauss elimination, and Gauss Jordan elimination.

2. Teaching Material Design

At this stage, teaching materials for the STAD type cooperative model with the blended learning method include teaching nails and LKM are designed. The teaching material produced at this stage is called Prototype 1.

In detail the description of the teaching materials developed can be explained as follows.

a. Textbooks

The textbooks prepared are based on the components of the STAD type cooperative learning model with the blended learning method (prototype 1). This teaching material is equipped with assignments, practice questions, and special notes that can direct students to effectively discover concepts and principles related to the material being taught.

The main components of the teaching materials compiled are: (1) learning outcomes and final abilities of learning outcomes, (2) the benefits of learning material on a system of linear equations, (3) learning instructions, (4) learning activities that contain teaching materials, (5) summary of the material , and (6) practice questions that will be completed by students outside class hours.

b. Student Activity Sheet (LKM)

The preparation of the LKM is based on the components of the STAD type cooperative learning model, and those related to teaching materials. In this LKM, practice questions are presented through discussion with the aim of enabling students to improve their mastery of the material through independent study.

The main components of the developed LKM are (1) introduction containing learning outcomes and final abilities of learning outcomes, (2) activity instructions, (3) suggested learning activities, (4) assessed aspects, (5) teaching materials, (6) questions to be discussed, and (7) closing which contains students' self-measurement of mastery of teaching materials.

**1. Assessment Stage**

The activities carried out at this stage are: validating, testing, and revising the product. In detail the activities carried out at this assessment stage are presented as follows.

a. Validity test

Prototype 1, which was produced in the previous prototype phase, was given to two validators for validation (expert judgment). The results of the two validators' assessment of teaching materials such as textbooks and LKM are presented as follows.

1) Textbook Validation Result Data

Data validation results of two experts on textbooks using textbook validity assessment sheets are presented in Table 6**.**

Table 6. Data on the results of the textbook validity assessment

| No | Rated Aspect | Average Validator | | Average | Criteria |
|---|---|---|---|---|---|
| | | I | II | | |
| 1 | Fill | 4,1 | 4,3 | 4,2 | Valid |
| 2 | Presentation of material | 4,5 | 4,2 | 4,3 | Valid |
| 3 | Language Quality | 4,6 | 4,4 | 4,5 | Valid |
| 4 | The accuracy of the question formulation | 4,7 | 4,0 | 4,3 | Valid |
| **Average** | | 4,5 | 4,2 | 4,3 | Valid |

Table 6 illustrates that the average score of the two validators' assessment of all aspects assessed ranges from 4.2 to 4.5 with valid criteria. While the average score of all aspects is 4.3 with valid criteria. It can be concluded that the STAD cooperative model textbook meets the valid criteria and is feasible to be tested to see the practicality and effectiveness of the textbook being developed.

MFI Validation Result Data

Data validation results of two experts on MFIs using the MFI validity assessment sheet are presented in Table 7.

Table 7. LKM Validity Results Data

| No | Rated Aspect | Average Validator | | Average | Criteria |
|---|---|---|---|---|---|
| | | I | II | | |
| 1 | Fill | 4,7 | 4,0 | 4,3 | Valid |
| 2 | Presentation of material | 4,5 | 4,0 | 4,3 | Valid |
| 3 | Language Quality | 4,7 | 4,0 | 4,3 | Valid |
| **Average** | | 4,6 | 4,0 | 4,3 | Valid |

Based on Table 7 above, it can be seen that the average score of MFI validity for each aspect assessed is 4.3 with valid criteria. While the average score of MFI validity for all aspects assessed is 4.3 with valid criteria. The data shows that the developed MFIs meet valid criteria and can be tested to determine their practicality and effectiveness.

Based on the results of the validity data of the teaching materials above, namely textbooks and LKM, it can be described that the teaching materials for the STAD type cooperative model with the blended learning method have fulfilled the valida criteria. Thus the two teaching materials developed were revised according to validator input and then applied in the field. The product produced at this stage is called Prototype 2.

**a. Product Trials**

After the product has been declared valid by the experts, it will then be tested in the field, namely on students of the UKI Toraja Mathematics Education Study Program. Teaching materials trials are carried out through face-to-face learning and online learning to determine the practicality and effectiveness of the teaching materials developed.

1) The practical results of teaching materials

The practicality of STAD cooperative model teaching materials is determined from the results of observations of the implementation of teaching materials in learning, student activities, lecturer practicality, and student practicality.

a) Implementation of teaching materials

The results of the data analysis on the implementation of the STAD cooperative model teaching materials using the blended learning method from two observers are presented in Table 8.

Table 8. Data on the implementation of teaching materials in learning

| Fase | Observed Aspects | Score/Meeting | | Average | Category |
|---|---|---|---|---|---|
| | | P1 | P2 | | |
| 1 | Convey goals and motivate students | 13,5 | 14,0 | 13,8 | Very Practice |
| 2 | Group division | 9,5 | 9,0 | 9,3 | Very Practice |
| 3 | Presenting material | 13,5 | 13,0 | 13,3 | Very Practice |
| 4 | Team Work (Group) | 13,5 | 13,0 | 13,3 | Very Practice |
| 5 | Giving Quiz | 13,0 | 13,0 | 13,0 | Very Practice |
| 6 | Award Giver | 18,5 | 18,5 | 18,5 | Very Practice |
| 7 | Learning Atmosphere | 9,0 | 9,0 | 9,0 | Very Practice |
| | Average | 90,5 | 89,5 | 90,2 | Very Practice |

Based on Table 8 it can be seen that the actual average score for the phase: conveying learning objectives and motivating students is 13.8 in the very practical category, the division of groups is 9.3 in the very practical category, the phase of presenting material is 13.3 in the very practical category, the team work of 13.3 in the very practical category, the quiz giving phase (individual test) 13.0 in the very practical category, the awarding phase of 18.5 in the very practical category, and the learning atmosphere of 9.0 in the very practical category.

In general, the average score of the practicality of teaching materials in the STAD type cooperative learning model with the blended learning method is 90.2 in the very practical category. Thus it can be concluded that the STAD cooperative model teaching materials with the blended learning method developed are practical or easy for lecturers to use in learning.

a) Student activities

Student activity data during the learning process takes place in this assessment phase observed by two observers using student activity instruments. The results of the analysis of student activity data in learning with STAD-type cooperative model teaching materials implemented using the blended learning method are presented in Table 9.

Table 9. Results of analysis of student activities in learning

| No | Observed Aspects | Percentage / meeting | | Average |
|---|---|---|---|---|
| | | 1 | 2 | |
| 1 | Listen and record the teacher's explanation. | 24,2 | 24,4 | 24,3 |
| 2 | Read material through textbooks or the internet. | 11,4 | 10,6 | 11,0 |
| 3 | Answer questions/compose ideas. | 25,8 | 26,9 | 26,4 |
| 4 | Collaborate in working on quizzes/questions in LKM | 20,0 | 20,0 | 20,0 |
| 5 | Presents the results of the discussion. | 5,3 | 4,7 | 5,0 |
| 6 | Summarize the material. | 3,3 | 3,3 | 3,3 |
| 7 | Receive award | 10,0 | 10,0 | 10,0 |

Aspects of activity that are not included in active student involvement during learning are listening and recording teacher explanations (24.3%) and receiving awards (3.3%). The results of data analysis as shown in Table 9 above show that the average percentage of student activity that appears in learning during the two meetings ranges from 3.3% to 26.9%. The lowest percentage of student activity is summarizing the material with a percentage of 3.3% and presenting the results of the discussion (5.0%), while the highest student activity is answering questions/expressing ideas (26.4%) and listening and recording the lecturer's explanation (24.3%).

Table 9 also shows that in the first meeting (face to face learning) the percentage of student activity (65.7%) and in online learning fell to 65.6%. Thus in general it can be concluded that learning with STAD cooperative learning model teaching materials with the blended learning method can involve students actively in learning with an active percentage of 62.7% or classified as active.

**a) Lecturer practicality**

The results of data analysis on the lecturer's assessment questionnaire regarding the practicality of STAD type cooperative teaching materials with the blended learning method obtained through this trial are presented in Table 10.

Table 10. Data on the results of the lecturer's practicality assessment of teaching materials

| No | Rated Aspect | Score | | Average | Category |
|---|---|---|---|---|---|
| | | P1 | P2 | | |
| 1 | Ease of teaching materials | 33 | 31 | 32 | Very Practical |
| 2 | The attractiveness of serving teaching materials | 17 | 18 | 17,5 | Very Practical |
| 3 | Benefits of teaching materials | 36 | 35 | 35,5 | Very Practical |
| | Jumlah | 86 | 84 | 85 | Very Practical |

The data in Table 10 above shows that the actual average score observed for the ease of teaching material aspect is 32 in the very practical category, the actual average score for the attractiveness of the teaching material is 17.5 in the very practical category, and the average score for aspects of the benefits of teaching materials range from 35.5 to the practical and very practical categories. In general, the actual average score of the practicality of the lecturers on the teaching materials developed was 85 in the very practical category. Based on these data, it can be concluded that the STAD cooperative model teaching materials with the blended learning method developed are practical/easy for lecturers to use in learning.

**b) Student practicality**

The results of data analysis on students' assessment of the practicality of the STAD-type cooperative model teaching materials developed are presented in Table 11.

Table 11. Data on student assessment results

| No | Rated Aspect | Score | Category |
|---|---|---|---|
| 1 | Material | 27,4 | Very Practical |
| 2 | Learning strategies | 27,3 | Very Practical |
| 3 | Evaluation | 9,5 | Very Practical |
| 4 | Language | 13,3 | Very Practical |
| **Average Score** | | **77,6** | **Very Practical** |

Student assessment data on the practicality of the STAD type cooperative teaching materials developed as shown in Table 11 above shows that of the 12 students who gave an assessment of the teaching materials an average score of 27.4 was obtained or classified as very practical, learning strategy 27.3 with a very practical category, an evaluation of 9.5 with a very practical category, and an average score for the language used in the developed teaching materials is 13.3 with a very practical category.

Based on these data it can be concluded that the STAD type cooperative model teaching materials with the blended learning method developed are practically used by students in learning Linear Algebra for material on systems of linear equations in the UKI Toraja Mathematics Education Study Program with an average score of 77.6 or classified as very practical.

**1) The Results of The Effectiveness of Teaching Materials**

As many as 12 students in this trial class were given a description test of 5 question numbers. This test was given with the aim of seeing the effectiveness of STAD cooperative model teaching materials using the blended learning method. The results of the analysis of student learning outcomes test data are briefly presented in Table 12.

Table 12. Data on student learning outcomes

| No. Responden | Score | Category |
|---|---|---|
| 1 | 88,5 | Very Good |
| 2 | 100 | Very Good |
| 3 | 96,2 | Very Good |
| 4 | 93,3 | Very Good |
| 5 | 100 | Very Good |
| 6 | 92,3 | Very Good |
| 7 | 93,3 | Very Good |
| 8 | 87,5 | Very Good |
| 9 | 92,3 | Very Good |
| 10 | 98,1 | Very Good |
| 11 | 89,4 | Very Good |
| 12 | 96,2 | Very Good |
| **Average** | **93,9** | Very Good |

The student learning outcomes shown in Table 12 above show that of the 12 students who took the test the lowest score obtained was 88.5 or was categorized as very good and the highest score achieved was 100 or very well categorized from the ideal score achieved by students, namely 100 if the student answers all the questions correctly. In general, the average score obtained by students was 93.9 or categorized as very good. From these data, it can be concluded that the STAD type cooperative model teaching material with the developed learning method is effective for students' mastery of the material on systems of linear equations.

**a. Product Revision**

Revision of teaching material development products is carried out based on input and suggestions from experts as well as the responses of lecturers and students. In this development research, revisions were carried out twice, namely the first revision was carried out during validity tests by material experts and education science to obtain products that were feasible to be tested in

the field, and the second revision was carried out during product trials on students of the UKI Toraja Mathematics Education Study Program. .

1) Revisi produk pertama
   a) This first stage of revision was obtained from the results of the validity test during the product validation of material experts and educational sciences. The results of this validation are in the form of assessments, input for improvements, suggestions and product criticism for the development of STAD cooperative model teaching materials using the blended learning method. The first product revision is used as the basis for developing a product that is feasible to be tested in the field. As for the input of material expert validators and education science for improvements to teaching material development products, they are as follows.
      (1) The inverse method is not described in solving systems of linear equations.
      (2) The characteristics of the teaching materials developed must show differences from the characteristics of other teaching materials such as textbooks and LKM.
      (3) It is necessary to deepen the material on systems of linear equations in the sub-chapter on the material being developed.
      (4) The reference used for material on systems of linear equations in general, in order to link appropriate sources to the material in the Mathematics Education Study Program at tertiary institutions so that they can fulfill the graduates' achievements of the study program.
      (5) Improve writing grammar in the developed teaching materials.
      (6) Bibliary sources are updated and prioritized from articles in reputable SINTA and/or Scopus indexed journals.

2) Second product revision

The second stage of product revision was carried out during field trials on students of the Mathematics Education Study Program for the 2019/2020 school year who programmed linear algebra courses. This second revision was carried out based on student needs in the teaching materials developed. As for the input for product improvements to the development of teaching materials from the results of the Copa field test, they can be described as follows.

   a) Cover and layout need to be revised to make it more attractive and easier to read and understand.
   b) There is still a lot of writing that doesn't match the grammar, it's still written in lower case, please correct it.
   c) Examples of questions in several sub-chapters to be more sharpened, simplified, and reproduced as student exercises so as to enable students to understand teaching material.

The teaching materials are good, the material and assignments presented in the LKM are quite complete in each sub-chapter or in each assignment in the LKM, but perhaps the sources need to be added so that the scientific repertoire is more diverse and in accordance with the basics of material on a system of linear equations based on type cooperative learning models. STAD with blended learning method.

## DISCUSSION OF RESEARCH RESULTS

### validity

Based on the results of the validity test described previously, it can be concluded that Prototype 1 (teaching materials for STAD type cooperative models with blended learning methods and research instruments) all met the validity criteria. The validator suggested that the material on systems of linear equations be added to the material sub-chapter, namely the inverse method. The material of the inverse method is the method used in solving systems of linear equations, especially in the sub-material of systems of linear equations of two variables and three variables. In addition, the validator suggested that the developed teaching materials have different characteristics from other teaching materials.

According to Aswar (2013), the textbooks are in the valid category regarding the achievement of teaching materials regarding indicators of content and constructs. This means that

writing the contents and constructs of textbooks is in accordance with the contents of the material being developed. Aspects of the content which includes the suitability of the material with the final abilities of the learning outcomes, clarity of the scope or scope of the material, clarity of the importance of studying the material for a system of linear equations, adequacy of material to achieve final abilities, clarity of the sequence of material discussed in each learning activity, clarity of the benefits of learning material, and clarity of study instructions, and construct aspects which include the presentation of material, quality of language, and the accuracy of the formulation of the questions are all in accordance with predetermined criteria, so that the teaching materials for the STAD type cooperative model with the blended learning method are classified as valid. Thus the developed teaching materials can be widely used in tertiary institutions.

**Practicality of Teaching Materials**

Theoretically, the teaching materials developed according to the results of the assessment of material experts and education science have met the feasibility of being implemented in face-to-face learning and online learning. Empirically, based on the results of observations of the implementation of teaching materials (textbooks and LKM), student activities in learning, as well as the practicality of lecturers and students, it is stated that they meet the practicality criteria.

Textbooks are made by taking into account the characteristics according to Mintowati (2003) which contain the name and code of the course, a brief description of the course/topic, the use of the course/topic for students, learning outcomes, maps of the order of textbooks, schedules/time for study load, instructions studying teaching materials, summaries, and practice questions. These characteristics are the characteristics of STAD cooperative model textbooks when compared to other textbooks.

In this study the LKM developed was adapted to the form of learning (face to face and online) and the classroom atmosphere. Both face-to-face learning and online learning in a classroom atmosphere are designed like in a classroom, the LKM is designed like an activity sheet that contains material and questions that allow students to learn independently and in the end are able to construct their own material studied so that the final learning outcomes are achieved. The material in the LKM is described briefly but provides an overview of the overall material being studied as well as practice questions as material for discussion in the LKM which is designed to improve writing skills, and determine the set of solutions to system problems of linear equations. These characteristics are the characteristics of MFIs when compared to other MFIs.

**The Effectiveness of Teaching Materials**

The effectiveness of teaching materials in this study was seen from student learning outcomes. The learning outcomes test developed is intended to measure students' mastery of the material on systems of linear equations after being taught with STAD cooperative model teaching materials using the blended learning method. Test result data were analyzed statistically using the Excel program to obtain the average score, the highest score, and the lowest score.

Based on the results of the analysis of test data in the UKI Toraja Mathematics Education Study Program, an average score of 93.9 was obtained in the very good category. Thus it can be concluded that the STAD type cooperative model teaching materials with the blended learning method are effective for mastering the material on systems of linear equations.

**Product Review**

The purpose of this study was to develop teaching materials for STAD type cooperative models with blended learning methods on systems of linear equations. The final product produced in this study is in the form of Textbooks and LKM (Student Activity Sheets) adapted to the STAD type cooperative model with the blended learning method. Learning tools are also produced, namely SAP (Lecture Program Unit).

The advantages of the STAD cooperative model teaching materials with the blended learning method that have been developed in this study are (1) they can make students get rid of feelings of reluctance to interact with others, are reluctant to ask questions, and make them able to work together with

others. This is possible because in the STAD type cooperative model there is a teamwork stage through discussion where each group may not end their study if there are still members who have not understood the material or mastered the questions in the LKM. (2) easy to access and learn anytime and anywhere.

In addition to the advantages, there are also weaknesses, namely: it requires sufficient time because they have to go through scoring and ranking student work, and lecturers/researchers have not fully mastered online learning applications used such as zoom.

## CONCLUSION

Product development of STAD cooperative model teaching materials with the blended learning method on material systems of linear equations based on problem analysis and needs analysis. After going through the stages of review and trial and revision, it can be concluded that:

1. Teaching materials for STAD type cooperative models with blended learning methods on teaching materials for systems of linear equations have met the validity criteria. This can be seen from the validity of the teaching materials developed, namely the textbooks and LKM have met the validity criteria with an average score of 4.3.
2. STAD-type cooperative model teaching materials with the blended learning method (Textbooks and LKM) on material systems of linear equations are practically used by students and lecturers in learning. This can be seen from the results achieved in the trials obtained:
    a. The implementation of STAD cooperative model teaching materials with the developed blended learning method is classified as very practical for lecturers to use in learning.
    b. STAD-type cooperative model teaching materials with the blended learning method developed practically involve students actively in learning.
    c. Teaching materials for the STAD type cooperative model with the blended learning method are very practical for lecturers to use in learning teaching materials for systems of linear equations.
    d. STAD type cooperative model teaching materials with the blended learning method are very practical for students to use in learning teaching materials for systems of linear equations.
3. Implementation of STAD-type cooperative model teaching materials with the blended learning method which was developed in effective learning for students' mastery of UKI Toraja Mathematics Education Study Program on material systems of linear equations.

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