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## **Development of economic mathematics learning system through master model for students of economic education study program**

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### **Abstract**

The purpose of this study are 1) identifying the need for the development of an Economic Mathematics Learning System through the MASTER Model for students of the Economic Education Study Program in participating in the learning process, 2) developing a tool for making Economic Mathematics Learning System Development through the MASTER Model for students of the Economic Education Study Program in following the process learning, and 3) measuring or knowing the validity of the Economic Mathematics Learning System through the MASTER Model for students of the Economic Education Study Program in participating in the lesson. The study results found that the validation of material experts and learning system experts (learning models), it can be seen that the results of the validation of material experts are 4.44 or good and the results of validation by media experts are 4.33 or good. The results of interviews with lecturers and students as a whole showed good responses to the use of the MASTER learning model in the learning process.

**Keywords:** sistem pembelajaran model master

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### **1. Introduction**

One of the efforts that humans can make to compete in the future is by taking the highest education possible. Education is a process of changing one's attitudes and behavior in maturing through learning and training efforts, to create human beings who are not only good at academics but also have human character, education can be pursued both through formal and non-formal education. At present, education has become one of the primary needs of the Indonesian people. This is because through good education it is hoped that it can produce quality human resources. Traditional education that is very quantitatively-oriented and knowledge-based is no longer relevant to the demands of future life in the current era of globalization <sup>[1]</sup>. The desired education today is education that takes place contextually. The first follow-up of these demands is by reorienting the curriculum, from the traditional curriculum which tends to be subject-matter oriented towards being competency-based. By the essence of a competency-based curriculum, learning must be student-centered and contextual.

If a nation wants to progress in the field of education, there must be efforts to develop the potential and talents of students. To develop the potential and talents of students, this is done through a learning process.

With a good and quality learning process, students will gain knowledge, skills, and provisions to face various advances and challenges of the times. Learning is a process whereby a person's environment is deliberately managed to allow him to participate in certain behaviors under special conditions or to generate responses to certain situations <sup>[2]</sup>.

With quality education, quality human resources will be produced, and have the skills needed in their time. One of the functions of the world of education is to produce large amounts of output, be skilled and disciplined, and have the competencies needed in the world of work.

To improve the quality of education, various factors are needed. One of the factors is the improvement of the quality and competence of educators towards professional educators. Professional educators can work both individually and collaboratively in improving the learning process. Professional educators can create an active, innovative, and fun learning atmosphere. To improve the quality of learning, apart from educator factors, it is also influenced by other factors such as the atmosphere of the work environment, the availability of facilities and infrastructure, the availability of supporting funds, community participation, the leadership of the school principal and so on. These components are very important and play a role in achieving the success of the learning process.

The educator in this study is a lecturer who plays an important role in the learning process, especially for economic mathematics courses. A lecturer should be able to select and use a learning model that involves a lot of students to be active in the learning process both mentally, physically, and socially. So far, the learning process of economic mathematics tends to still use conventional learning models. This conventional model tends to take place in one direction, generally, from lecturers to students, lecturers dominate learning, learning tends to be monotonous, resulting in students feeling bored and tormented so that it has an impact on learning outcomes of economic mathematics which are less than optimal. Therefore, in teaching economic mathematics to students, lecturers should prefer a variety of approaches to learning models that are appropriate to the situation so that the planned learning objectives will be achieved.

Learning economic mathematics is expected to be able to create a student paradigm for the usefulness of economic mathematics in life. However, it is not easy to instill in students the perception that mathematics is very important in life. This is because mathematical concepts are presented in an abstract form.

Students will learn better if students are in a stress-free environment, see the benefits of the subject of learning, feel challenged to think ahead, and can explore what is learned to understand the lesson. "Learning is an act of getting experience, knowledge, skills, values by understanding what to do and how to do any tasks by synthesizing the different types of information perceived by us. Learning brings about changes in the existing behavior of an individual. Human beings, animals, and plants do learning" [3].

Each subject is included in the economic mathematics course, the learning process carried out by students is only limited to mastering the material as test material. In fact, according to the demands of the applicable curriculum, students are expected not only to accumulate knowledge but also to be able to achieve competence, namely the relationship between knowledge, attitudes, and skills that can be implemented in the life around students. Along with the development of the world, it requires the ability to analyze every condition so that it can solve problems critically. It requires improvements in learning models in higher education to improve mathematical critical thinking skills. The learning model or strategy is one of the factors that influence the learning process. The model must be adapted to the student's condition so that the desired learning objectives will be achieved. The learning model is a plan or pattern that can be used to form a curriculum (long-term learning plan), design learning materials, and guide learning in class or otherwise [4].

There are still many students who have difficulty understanding the material in the economic mathematics course, this is because lecturers often teach without using the right learning system. The monotony of lecturers in teaching also makes students less active when the teaching and learning process is ongoing. The monotonous learning atmosphere makes students feel bored and unmotivated to study. Students are lazy to ask questions, these problems make students ultimately unable to develop their potential. If seen in the fact that the difficulty of students in developing their potential learning abilities is caused by the selection of a learning system that is not appropriate because lecturers only rely on a learning system that is only centered on educators not on students in delivering learning material, so students are not allowed to seek problems in a phenomenon. Therefore the learning system is an important component in the implementation of the learning process. Where, the system is a collection of components that are interconnected with clear boundaries, and work together to achieve goals by receiving input and producing output in an organized transformation process [5]. The right learning system using the right learning model will also make it easier for educators to convey information about learning material, using a learning system with the right learning model will also create a learning atmosphere that makes students motivated so that they can stimulate student activity while learning so that the learning objectives that have been made by the teacher can be achieved effectively and efficiently.

In connection with this, one alternative learning model that can be applied is the MASTER learning model. The MASTER learning model is part of the accelerated learning method [6]. Quick learning and clear thinking skills are two key personal skills for a decent life in the 21st century. Both skills will generate independence and self-confidence. This fast learning method will unleash the hidden abilities of humans. In essence, this method recognizes that each of us has a personal way of learning that suits

his character. From the problems experienced in the learning process of economic mathematics, it is necessary to have an innovation in the economic mathematics learning system through the development of a MASTER model that is developed in learning. The objectives of this research are 1) identifying the need for the development of an Economic Mathematics Learning System through the MASTER Model for students of the Economic Education Study Program in participating in the learning process, 2) compiling a tool for making Economic Mathematics Learning System Development through the MASTER Model for students of the Economic Education Study Program in participating the learning process, and 3) measuring or knowing the validity of the Economic Mathematics Learning System through the MASTER Model for students of the Economic Education Study program in participating in the lesson.

## 2. Materials and Methods

The MASTER learning model can be interpreted as a learning process consisting of six effective stages that can help a person more easily obtain information and remember that information. The understanding of the stages of the MASTER learning model is as follows: [6].

1. **Motivating Your Mind:** In learning, students must be in a state of mind that is "rich in mind" that is relaxed, confident, and motivated, if students are stressed and lack self-confidence, then these students cannot learn well [7]. Ways to produce motivational learning, lecturers can carry out several ways including inviting students to see the relevance of what they are learning, creating an environment that is conducive to collaboration, namely by positioning them in groups, inviting students to instill positive things that can increase their self-confidence, makes students not afraid of making mistakes, namely by making mistakes that students make
2. **Acquiring the information:** In this step of obtaining this information, several ways can be done namely, the first step is to obtain information by emphasizing understanding the core ideas of the subject The second step is one of the valuable life skills is the ability to work effectively in informal teams [7].
3. **Searching out the meaning:** After obtaining the information, the next step is to guide students to investigate the meaning for a deeper understanding. There are several steps or ways that can be taken to investigate the meaning, including guiding students to find analogies by comparing material that is new to students with concepts that are familiar to students. Conduct learning with challenging questions, where students are given challenging or difficult questions and students solve them with a group of friends [7].
4. **Triggering the memory:** Repetition of material is very important in learning because one of them is that we want to get something new and can be stored in long-term memory. memory is very important to us, without memory we have no identity, giving statements repeatedly will make us remember it. Memories will provide experiences that are important for the future [8]. Thus learning that focuses on memory is very important for students to remember all the lessons given as their experiences in the future. Children are presented with new information throughout the school day

and given little opportunity to consolidate new information before more new information is presented to them<sup>[9]</sup>.

5. **Exhibiting what you know:** Teachers can find out whether students understand what they are learning by providing opportunities for students to prove that they understand (have deep knowledge) of the concepts given. If the teacher can teach students well, then the teacher really shows that the teacher has understood, the teacher not only knows it, but the teacher also has it<sup>[6]</sup>.

6. **Reflecting on how you've learned:** Students have to think about what are the best efforts to get the best results too. This can be done by always evaluating how to learn every day. In other words, students can find out the strengths and weaknesses of themselves in learning more deeply about the learning process. Can be done by doing questions or making those related to the learning. The development of an economic mathematics learning system through the MASTER model adopts the original Design-Based Research (DBR) model as in the following figure<sup>[10]</sup>:

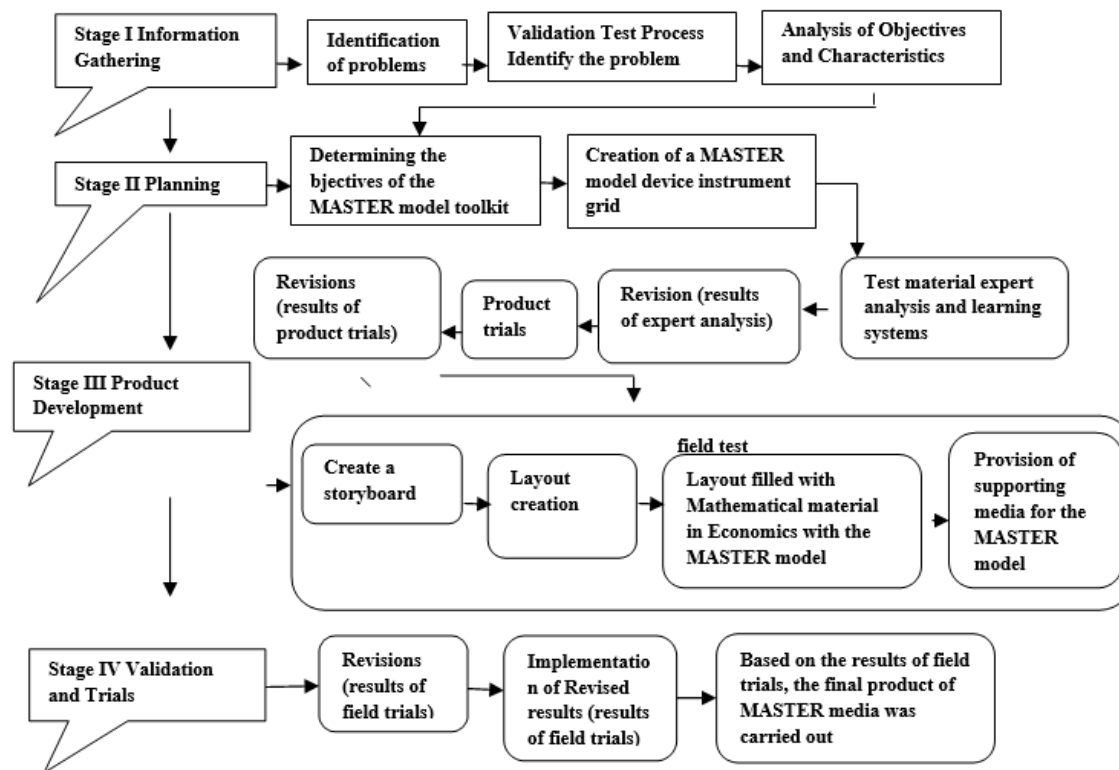


Fig 1: Learning System development procedure Mathematics through the MASTER Model

### 3. Results

#### 1. Product Development Results

This development research aims to produce an interactive learning model using the MASTER model in economic mathematics courses. The material in the economic mathematics course is adjusted to the learning program units that are made in such a way that learning becomes interactive between students and lecturers. The learning model developed was declared fit for use based on validation by material experts, validation of media experts, and test results by lecturers as well as student responses from economic education study programs. This development research refers to a development model that is limited to several stages<sup>[10]</sup>. 1) information gathering stage; 2) planning stage; 3) product development stage; and 4) the validation and testing phase. The following is an explanation of each stage carried out in this research and development:

#### 1. Information Gathering Stage

The collection of information becomes the initial guideline for researchers to conduct needs analysis in learning activities and to compile the concept of learning media in economic mathematics courses which will be further developed later. This information is

about the learning process in the classroom which is still considered monotonous. The model used by the lecturer is only a conventional learning model and sometimes uses tools to facilitate the use of learning models such as power points/slides. Such a learning process affects low student interest. Therefore, the results of this preliminary research are used as a guideline for developing the concept of a learning model for economic mathematics courses which will be further developed later. Furthermore, conducting a field study by reviewing Competency Standards (CS) and Basic Competencies (BC) by the KKN curriculum, to obtain an economic mathematics subject matter for economic education students that is easy to understand and practice in the field.

#### 2. Planning Stage

This second stage is the planning stage which includes determining the objectives of making MASTER learning models in economic mathematics courses. The development of the MASTER model aims to make the learning process of economic mathematics enjoyable, provide enthusiasm for learning, not be monotonous, motivate students to focus on learning, and make it easier for students to understand the material in economic

mathematics courses. Furthermore, making a lattice research instrument which is the criteria for evaluating the interactive learning model. The completed instrument grid was then developed into a research instrument. The research instruments that will be used are validation sheets, observation sheets, and interview guides. The validation sheet is used to determine the feasibility of the MASTER learning model based on the assessment of material experts and experts in the learning system. Material experts provide assessments based on material aspects, learning, and language, while learning system experts provide assessments based on aspects of programming and the appearance of learning models. Observation sheets and interview guides are used to determine the responses and responses of lecturers and students regarding the use of the MASTER learning model in the classroom. Instrument validation is carried out by validators who are experts in the field of education.

### 3. Product Development Stage

At this stage, the MASTER learning model product was made. The steps taken are; 1) Create a storyboard. The storyboard was created to facilitate the creation of media and to determine the next stage of development so that parts of the learning media can be well structured. Storyboards are made by sketching on paper, a sketch that has been completed, and then redrawn using a computer. 2) The storyboard is then used as a reference for making layouts. The layout is made concerning the aspects of color and composition; 3) the layout that has been completed is then filled with material on human interaction with the economic environment. The material in the MASTER learning model in this economic mathematics course consists of eight sub-materials, namely, series, linear functions, non-linear functions, limits, differentiation of simple functions, differentiation of compound functions, integrals, and matrices and 4) After the writing step of the material, media then gave videos and images that can support the material. Besides, it is also equipped with instructions for use in pdf format.

### 4. Trial Validation Stage

The model validation stage is carried out so that the MASTER learning model developed can be identified as its feasibility based on the assessment of material experts and learning system experts. Validation of the MASTER learning model has carried out by 1) material experts who are competent in the field of

human interaction with the economic environment; 2) learning system experts who are competent in the field of MASTER learning models. The assessment data of the material expert validation results will be discussed in the results of the feasibility assessment the model product that has been validated is then revised according to expert suggestions and input during the validation process. After the MASTER learning model has been revised, a trial phase of the use of the model in classroom learning is carried out, which aims to determine the responses of lecturers and students to the developed MASTER learning model.

The trial phase was carried out on students of economic education at the Teacher Training and Education Faculty of Batanghari University. Testing is done by using models in classroom learning by lecturers. During the use of the model, the researcher made observations on the use of the model. After using the media, the lecturer is interviewed to be asked for his comments, suggestions, and comments regarding the MASTER learning model being developed. Apart from lecturers, students were also interviewed to ask for their comments and comments regarding the MASTER learning model being developed. The MASTER learning model that has been tested in the classroom is then revised again based on suggestions and input from lecturers and students. The final result of this research and development is the product of the MASTER learning model for learning economic mathematics courses in the Faculty of Teacher Training and Education, Batanghari University. The MASTER learning model product is packaged on a CD.

### 2. Feasibility Assessment Results

The following is the data on the results of the feasibility assessment of the economic mathematics learning model and the evaluation data are described as follows:

#### 1) Material Expert Validation Data

Material validation is carried out by experts in the field of material and learning systems.

Validation is carried out to obtain information that will be used to revise the material and improve the quality of the effectiveness of the learning model.

The validation results are obtained using an assessment through the validation sheet. Assessment the results of the final validation assessment from material experts can be seen in table 1 and table 2 below:

**Table 1:** Material Quality Aspects Assessment by Material Experts Before revision

No	Indicator	Score
1	Conformity of Material with Competency Standards and Basic Competencies	3
2	Truth of Concept	3
3	Update of Material	4
4	Clarity of Material	3
5	Sufficiency of material to achieve learning objectives	3
6	Clutter in the delivery of the material	4
7	The accuracy of selecting images to describe the material	4
8	The accuracy of selecting animation to explain the material	3
9	The accuracy of selecting videos to explain the material	4
10	Feasibility examples to clarify the material	3
11	Feasibility of information on economic mathematics material	4
12	The suitability of the questions with the material	4
13	Question difficulty level	3
14	The material is easy to understand	4

15	Accuracy of language and spelling	3
	Total Score	52
	Mean	3,46

**Table 2:** Material Quality Aspects Assessment by Material Experts after Revision

No	Indicator	Score
1	Clarity of study instructions	5
2	The accuracy of selecting the material provided	4
3	Ease of learning menu selection	5
4	Relevance as a learning medium	5
5	Positive reinforcement for correct answers	4
6	Positive reinforcement for wrong answers	4
7	Provide feedback to students	4
8	The attractiveness of material to be studied	4
9	Providing practice questions for students' concept understanding	4
10	The use of media motivates students to focus on learning	5
	Total Score	44
	Mean	4,4

Apart from these data, there are several suggestions for improving the media in terms of material. These improvements will form the basis of the first phase of the revision. Based on the assessment of the material expert, the product is feasible to be tested with revisions as recommended. Suggestions and improvements delivered by material experts are as follows: 1) Explanation of material on the concept of learning economic mathematics accompanied by elements of Motivating, Acquiring, Searching, Triggering, Exhibiting, and Reflecting (MASTER), 2) Addition of Permnen No. 11 of 2009 on MASTER process material, 3) Adding sources to each material explanation, 4) Adding pictures to the information from each economic math material, 5) Improving images on the home menu, 6) Improving grammar, and 7) Making questions more difficult.

## 2) Learning System Expert Validation Data (Learning Model)

Expert validation of learning systems (learning models) is carried out by experts in their fields. Validation is carried out to obtain information that will be used to revise the model and improve the quality of the learning model.

The results of the validation are obtained using assessment through the validation sheet which includes two aspects, namely the quality of the material programming and the aspect of appearance.

The assessment is carried out after the validator reviews the learning model developed. The results of the final validation assessment score from the MASTER model learning system expert can be seen in table 3 and 4 below

**Table 3:** Expert assessment of the MASTER model learning system Before Revision

No	Indicator	Score
1	The level of student interaction using the MASTER model	3
2	Ease of interacting with the MASTER Model	3
3	Ease of implementing the MASTER model	3
4	Ease of use of media in the MASTER model	3
5	Efficient use of media	4
6	Appropriate use of links	4
7	Animation quality	4
8	Video quality to sharpen memory	3
9	Image quality	3
10	The accuracy of the MASTER model with the curriculum	3
11	Provide feedback to students	4
	Jumlah Skor	37
	Rata-Rata	3,36

**Table 4:** Expert assessment of the MASTER model learning system Before Revision

No	Indicator	Score
1	Perubahan cara pembelajaran menggunakan MASTER	4
2	Ease of interacting with the MASTER Model	4
3	Ease of implementing the MASTER model	4
4	Ease of use of media in the MASTER model	5
5	Changes in layout and addition of economic mathematics material with the MASTER model	4
6	Addition of the Next Material Link Menu	5
7	Video quality to sharpen memory	4
8	The accuracy of the MASTER model with the curriculum	5
9	Provide feedback to students	4



	Jumlah Skor	39
	Rata-Rata	4,33

The validation of the MASTER model learning system expert resulted in input which was then followed up with the implementation of product revisions as for the input obtained including 1) Changes in learning methods using MASTER, 2) Changes in the layout of adding economic mathematics material with the MASTER model, and 3) Addition Next Material Link Menu.

### 3) Product Revision Results

The MASTER learning model is developed through the validation stage by learning system experts (learning models) and materials, before being tested. Based on the results of validation by learning system experts (learning models) and material experts, several parts of the learning model must be improved. In addition to improvements based on the assessment of media experts and material experts, learning media were also improved based on trials. The following is an explanation of the repair process:

#### a. Revision Stage I

The first revision was made referring to suggestions, comments, and validation results from material experts and learning system experts (learning models). The revisions made in this first revision are:

##### 1. Material expert advice

To improve the quality of the learning model developed, the material expert provides some input on things that need to be improved in the learning model by adjusting material in economic mathematics courses so that it is more interesting and not boring in the learning process.

##### 2. Expert advice on the MASTER Model learning system

To improve the quality of the learning model, learning system experts provide some input related to MASTER, namely Motivating (about how to get students motivated in learning economic mathematics) Acquiring (how to get the right information in the process of learning economic mathematics), Searching (investigating the meaning contained in learning economic mathematics), Triggering (triggering memory to get something new and can be stored in long-term memory), Exhibiting (showing what is known so that it can have deep knowledge), and Reflecting (reflecting on how the student learns so that students should think what best efforts to get the best results too).

#### b. Revision Stage I

Stage II revisions are carried out referring to suggestions, comments, and results of observations during product trials and user interviews. The revisions made in this stage II revision are Printing instructions for use Based on the results of observations and interviews with the research teacher, the results show that the teacher does not experience difficulties in operating instructional media, but the teacher provides suggestions so that instructions for using the media can be printed so that the teacher is easier to learn how the media operates.

### 4. Discussion

The result of this research and development is the product of the MASTER learning model with the material in economic mathematics courses. There are several problems behind the

development of the model in this study. These problems include a) not an optimal use of computers on campus, still limited to certain subjects; b) lack of ability and willingness of lecturers in developing learning models, especially the MASTER learning model, 3) the use of learning models in learning activities has not varied, and 4) there are not many models with existing material in economic mathematics courses that meet the eligibility for use in learning.

This research and development are carried out by referring to the research and development stages, which consist of ten stages in research and development <sup>[10]</sup>. However, in this research and development, the ten steps are simplified into four steps, namely Stage I (Information Gathering), 2) Stage II (Planning), Stage III (Development), and Stage IV (Validation and Trial). The factors that underlie the simplification are: a) Limited time. If this research and development are carried out in ten stages, it will require a relatively long and long process of time and process. Therefore, through simplification into four stages of research and development, this is completed in a shorter time but still efficient and effective in the process and results. b) Cost limitations Relatively large costs will be required if this research is conducted in ten stages. Therefore, through simplification, this research phase can be completed at a relatively affordable cost. c) Similarity of stages Based on the ten stages of research and development of the Borg & Gall model, several stages have the same objectives. This similarity can be seen at several stages, such as the preliminary field testing stage, the main field testing stage, and the operational field testing stage. There are similarities at several stages of the trial, making the researcher simplify into one trial stage, named after the revision of stage I. The similarity of objectives is also seen at the product revision stage so that the researcher simplifies into two stages of product revision, namely after the product is validated and after the product trial.

To limit research and development on a small scale includes limiting research steps "If you plan to do an R & D project for a thesis or dissertation, you should keep these cautions in mind. It is best to undertake a small-scale project that involves a limited amount of original instruction design. Also, unless you have substantial financial resources, you will need to avoid expensive instructional media such as 16-mm film and synchronized slide tape. Another way to scale down the project is to limit development to just a few step of the R & D cycle " <sup>[10]</sup>.

The information collection stage is carried out by reviewing the content standards which include Competency Standards (SK) and Core Competencies (KI) and literature review. After the information gathering stage is complete, the planning stage is followed. At this stage, a research instrument grid is made and a research instrument is made. The research instrument grid was made based on the criteria for evaluating learning media according to Walker and Hess. According to Walker and Hess, the media assessment criteria serve as guidelines in making the validation sheet instrument grid, observation sheet, and interview guidelines. The completed instrument grid will then become a guide in making research instruments.

Furthermore, the product development stage consists of making a storyboard, creating a layout, writing material, and adding video

sound effects, animation, and images. After the product development is complete, a MASTER learning model is obtained on the material in the economic mathematics course. The initial product of the MASTER learning model is then validated by material experts and learning system experts (learning models). Material experts validate twice, this is due to the average score of the material validation results which shows a value of 3.46 which is in the sufficient category so that it does not meet the standards for testing. Furthermore, the material for use in the MASTER model is revised by the suggestions and comments of material experts. After the revision was made, an average score of the results of material validation was 4.4 which was categorized as good, so that the interactive learning media had met the standards for testing. The learning system expert (learning model) validates it twice as well. This is due to the mean score of the results of the expert validation of the stage I model, which shows a value of 3.36 which is in the sufficient category so that it does not meet the standards to be tested. The MASTER learning model is then revised according to the suggestions and comments of material experts and learning system experts (learning models).

The revised MASTER learning model was re-validated by media experts. Validation by media experts in stage II showed a mean score of 4.33 which was in the good category. Based on these results, the model is feasible to be tested. Researchers are looking for lectures that have implemented the KKNI curriculum to carry out trials. This is because the material in the economic mathematics course is the material listed in the KKNI curriculum. Looking for the right time to carry out lectures in the class by looking at the existing facilities. The facilities referred to are the availability of LCD projectors and projector screens in every classroom. Testing is carried out by using the MASTER learning model in the learning process by the lecturer. During the learning process using a model, the researcher made observations on the use of the model. Lecturers who have used the model in the learning process are then interviewed to be asked for responses, comments, and also suggestions regarding the media being developed. 2 lecturers were interviewed. Apart from conducting interviews with lecturers, interviews were also conducted with students. The student interviewed totaled 15 people. Based on interviews with lecturers and students, the model has revised again. The results of the stage II revision produce the final product of the MASTER learning model in economic mathematics courses.

## 5. Conclusions

This research and development resulted in a product in the form of a MASTER learning model in economic mathematics courses for students of the FKIP Unbari economic education study program. The steps are taken to produce the MASTER learning model are as follows: a) the information gathering stage; b) the planning stage; c) the development stage, and d) the validation and testing phase. The material in the learning model consists of eight sub-materials, namely: a) series, b) linear functions c) non-linear functions, d) integrals, e) simple differentials, f) compound differentials, g) limits, and d) matrices. In each material, students will be asked to be actively involved in learning. The learning model developed is also equipped with practice questions at the end of the lesson for evaluation.

Based on the validation of material experts and learning system experts (learning models), it can be seen that the results of

validation by material experts are 4.44 or good and the results of validation by media experts are 4.33 or good. The results of interviews with lecturers and students as a whole showed good responses to the use of the MASTER learning model in the learning process.

The implications of this research and development are: 1) The MASTER learning model developed can be used in economic mathematics learning because it contains material in the KKNI curriculum. 2) The MASTER learning model can assist lecturers in delivering material on economic mathematics courses. The MASTER learning model can also attract student interest and motivation in participating in learning activities. This is based on observations of the use of the model and also by the comments of lecturers and students during the interview.

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