

Strategy for Utilizing Quantity Method Software in the Development of Operations Research Course with Realistic Mathematics Educations Approach

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ABSTRACT

The change in the learning system during the Covid-19 pandemic resulted in controversy among students and educators. Online learning is considered an innovation in learning in the midst of increasingly rapid technological advances, such as the use of e-learning applications, classroom, zoom or google meet, which is a method used by educators for students in online learning. Operations Research is one of the quantitative decision-making courses, the completion process cannot be separated from the methods that use mathematical calculation tools. One alternative method used is the use of Quantity Method software. The purpose of this research is to provide the best solution to students who are studying operations research courses, where in the learning process that is undertaken, it makes it easier for students to make decisions by developing teaching materials by applying Realistic Mathematics Educations learning approach with data processing tools. Quantity Method software. So that it is expected to be useful for students, especially in processing and analyzing data, and ultimately producing skilled and innovative resources with technological advances, as well as to support the nation's quality competitiveness. The research method uses a Grounded Theory approach, namely research that aims to construct theoretical concepts developed based on empirical data in the field. Collecting data using observation techniques, interviews, observations, document searches, and literature review. The data analysis technique used in this research is descriptive analysis. The results of the study explain that students who took part in Operations Research learning, with the strategy used to learn Operations Research using the Realistic Mathematics Educations approach using the Quantity Method software tool was said to be successful.

Keywords: *Quantity Method Software, Operations Research, Realistic Mathematics Educations, Quantity Method Software*

1. INTRODUCTION

The learning system among educators is a topic that is always very interesting to discuss. The teachers strive to provide the best teaching methods and strategies to their students, so that they can become the nation's next generation as the foundation of the future. This can realize the vision of the Ministry of Kementarian Riset and Teknologi Dikti in 2015-2019, namely to realize quality higher education by producing graduates who are educated and skilled, knowledgeable, technologically capable and innovative in supporting the nation's competitiveness.

In improving the quality of education, each university has a reference in the learning and teaching process. For the Operation Research course, which is a series of economic activities that

are shaped in mathematical models and completed using methods that are in accordance with the model in completing decision-making, so this course is also referred to as a decision-making or science course. management. This course is taught in several faculties, such as the Faculty of Economics, Agriculture, and Engineering. From the results of observations, specifically the social and economic sciences, that the weak ability of students in learning related to manual data processing, especially the Operations Research course, which is a quantitative decision-making course so that students who take the course better understand the direction and learning objectives, it is hoped that research will be carried out in such a way that can select and design a combination of learning models and teaching materials, it is necessary to strive to

design teaching, provide the widest opportunity for students to learn by building their own knowledge.

Realistic Mathematics Educations (RME) approach can be an appropriate alternative to learning, with this learning model, students are required to construct knowledge with their own abilities through activities carried out in the teaching and learning process activities that are associated with reality as part of human activities [Hafni & Iskandar, 2015]. The learning approach which is carried out by means of Realistic Mathematics Educations is expected that students will find it easier to learn mathematics by using real economic applications and it is necessary to develop science and technology for lecturers who function as teaching providers so that teachers and students are equally active and there is technology data processing tools, namely Quantity Method (QM) software, where this software is software designed to solve quantitative data processing problems in decision making in the subjects of Operations Research courses. The use of Quantity Method software is expected to provide benefits for lecturers who teach Operations Research courses. So that it can be taught in other universities and provide benefits for each study program at universities in the city of Medan, especially the Muhammadiyah University of North Sumatra, based on Al-Islam and kemuhammadiyah, and can produce competent graduates, and can increase competitiveness and fighting power, who excel in building civilization nation, by developing science, especially Economics.

2. LITERATURE REVIEW

2.1. Learning Strategies

Johnson [2013] suggests that learning is a process that is carried out in a certain way or model. According to Arikunto [2010], the learning model is a conceptual framework that is used as a guide in conducting learning. The learning strategy is a plan, in which there is a series of activities specifically designed. Learning strategies according to Frelberg & Driscoll [1992] can be used to achieve various objectives of providing subject matter at various levels, for different students, in different contexts. Gerlach & Ely [1980] say that learning strategies are the chosen ways to deliver subject matter in a particular learning environment, including the nature, scope, and sequence of activities that can provide a learning experience to students. In improving the quality of a student, for example in terms of the quality of education is to form appropriate learning strategies. This learning strategy is very much needed in the world of education. So that the teaching and learning system

in the classroom does not become monotonous or boring, and can help students develop their thinking patterns.

2.2. Operations Research

The definition of Operations Research is familiar to students, especially the Development Economics and Management Studies Program at the Faculty of Economics. Operations Research is inseparable from the numbers in the presentation of models, tables and graphs, always associated with past and current conditions in a company or agency or institution. Such as the topic of Linear Program Model, Transportation Model, Assignment Model, and Network Model [Taylor; 1993, Widjaja; 2003, & Hillier; 2008]. Operations Research is something that is very necessary, because it can act as a reference for future conditions. Operations Research is more likely to be used in the social sciences, especially economics, such as destruction data, economics, trade, and other economic approaches in policy evaluation.

2.3. Quantity Method (QM) Software

One of the data processing software is Quantity Method software which is a quantitative data processing program, which in general can be used to solve data analysis problems descriptively or inductively [QM Inc, 2009]. In particular, this software is very widely used in the development of science and technology and in learning methods of Economics, especially Management Studies Program in evaluating policies both in companies and in government, so that using this data processing tool will make it easier for students to take part in learning for the following courses is continuous in the study program, especially at the Faculty of Economics. The design of the trial implementation of the use of data processing software in the development of Operations Research where student activities are observed, motivated, and evaluated and monitored, during and after the use of the development of teaching materials is carried out. Researchers analyzed student perceptions and the impact of using the development of teaching materials on lecturers, so that improvements can be made to deficiencies in the preparation of developing teaching materials, and then being able to make Operations Research teaching materials with Quantity Method software data processing tools. Then socialize it at their respective universities, and in scientific forums and journals.

2.4. Realistic Mathematics Education (RME) Approach

According to Arikunto [2010], the learning model is a conceptual framework that is used as a guide in conducting learning. Meanwhile, Kuncoro [2003] suggests that the learning model is basically a form of learning that is illustrated from beginning to end which is presented specifically by the teacher. In other words, the learning model is a frame of an approach or learning technique that is depicted from beginning to end, presented specifically by the teacher or lecturer.

In Operations Research learning, the subject matter is to relate it in real life that can be coupled with the Realistic Mathematics Education (RME) approach. Barnes [2004] states that the main idea of the Realistic Mathematics Education learning model is that someone who studies statistical mathematics should be given the opportunity to reinvent ideas and concepts for a problem with adult guidance. Efforts to rediscover these ideas and concepts are carried out by utilizing reality and the environment close to the person [Sudrajat, 2008]. Likewise, Operations Research is basically the use of reality and the environment that students understand to facilitate the learning process better.

In general, a person is interested in studying something diligently when he sees the benefits of what he learns in his life, it can be in the form of the possibility of increasing his welfare, self-esteem, satisfaction, and so on. A person's perception of something also influences his attitude towards that thing [Arikunto, 2010]. According to Gravemeijer [in Arrifadah, 2004] the basic characteristics of the Realistic Mathematics Educations approach, namely: 1) Using contextual problems, 2) Using models, 3) Using student contributions in problem solving, 4) There are links between parts of the subject matter. While Wijaya (2012) describes the process of solving realistic problems in the application of Realistic Mathematics Educations, namely: 1) Starting with real-world problems, 2) Identifying mathematical concepts that are relevant to the problem, then organizing the problem according to mathematical concepts, 3) Gradually leaving the situation the real world through the process of formulating assumptions, generalizations, and formalization. This process aims to translate real-world problems into representative mathematical problems. 4) Solving mathematical problems (occurring in the world of mathematics), and 5) Re-translating mathematical models into real solutions. Likewise with Operations Research learning which is a picture of the real world. Hafni [2015] stated that the Realistic Mathematics Education Learning

Model provided specifically aims to increase students' ability to make mathematical models so that they can solve problems in the mathematical model as the application of economics, and in general so that whatever students face in lectures, for any subject, which is related to calculations, they consider it not difficult, because mathematics is a logically acceptable tool, which is used to solve problems related to economics. So that students feel that mathematics is easy, the benefits are clear, and the final grade is satisfactory.

3. RESEARCH METHODS

This study uses a Grounded Theory approach, namely research that aims to construct theoretical concepts developed based on empirical data in the field. Collecting data using observation techniques, interviews, observations, document searches, and literature review. While the data analysis technique used in this research is descriptive analysis.

4. RESULTS AND DISCUSSION


The Operations Research course is a quantitative decision-making course, where decisions are taken from the information provided by allocating limited resources so that the goals are optimal. The information provided is data in the form of numbers, which is also called quantitative data. From the data obtained, a model is formed using mathematical symbols, so that solutions are sought using methods that are in accordance with the model formed, the end of the process is decision making, which is called a quantitative decision-making course.


From the survey results obtained using the google form and running questionnaires and interviews with lecturers who teach Operations Research courses and several students who have taken this course, especially in the Management Study Program, information was obtained that there are problems faced by students regarding Operations learning. Research. Hafni [2021] concludes that students' perceptions of learning Operations Research courses with the teaching materials used by each lecturer and student consist of the the sub-variables of Feeling Good, Feeling Interested, General Impact, and Motivation, are in the high category. However, due to the Covid-19 pandemic situation, there has been a change in the learning system which has resulted in controversy among students and educators. Online learning is considered an innovation in learning in the midst of increasingly rapid technological advances, such as the use of e-learning applications, classroom, zoom or google meet, which is a method used by educators for students in online learning. So the

strategy used in Operations Research learning which is one of the quantitative decision-making courses, in the completion process cannot be separated from the methods that use mathematical calculation tools, one of which is the use of Quantity Method software. Trials on students who are undergoing the teaching and learning process in this course for the problems contained in the subject matter of Operations Research, Linear Program Models, Transportation Models, Assignment Models, Network Models, with a Realistic Mathematics Education learning approach with tools data processing Quantity Method software. From the author's previous research, it is known that the trial of Realistic Mathematics Educations Learning model for Operations Research learning with the subjects of Linear Program Models and sub-topics: 1) Forming Linear Program Models, 2) Completing Linear Program Models, and 3) Utilizing Quantity Method software. The results obtained with the Planning stages, Action Implementation Stages, Observation and Monitoring Stages, and Reflection Stages, concluded that from the delivery of material with the learning stages carried out, the student ability questionnaire to read and create a Linear Program Model with the highest number of students was in the once capable category. is 67.10%. The student ability questionnaire to complete the Linear Program Model with the graphical method and the simplex method with the highest number of students in the once capable category is 47.10%, and the student ability questionnaire to complete the Linear Program Model with data processing tools Quantity Method software with the largest number of students being in the very capable category is 84.90%, and from the test results given to students the average value is 90. This learning can be said that the learning model taught to them is successful, namely the Realistic Mathematics Educations approach with Quantity data processing tools Software methods.

Based on the results of the research above, it is continued with classroom action learning for all subjects of the Operation Research course with case resolution other than the manual method, using Quantity Method software data processing tools with the following steps for use.

1. Select **QM For Windows**, select **Module - Linear Programming**.
2. Select the **File – New** menu.
3. Create a title for solving this problem by filling in the **Title** section, if the Title is not filled in, the QM ForWindows program will create its own title according to the default (benchmark).

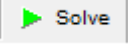
4. Fill in the number of constraints by clicking the mark  in the **Number of Constraints** box.

5. Fill in the number of variables by clicking the mark  in the **Number of Variables** box.

6. Select the goal to be searched for in the **Objective** section, if the goal to be sought is maximization, select **Maximize**, and vice versa, if the goal to be sought is minimization, then select **Minimize**.

7. Then click OK,

8. Fill in the numbers according to the question, in the appropriate box.

9. Finish by clicking the button  on the toolbar or from the **File - Solve** menu, or by pressing the **F9** key on the keyboard.

There are 6 outputs (displays) generated from problem solving, which can be selected to be displayed from the Windows menu, namely: Linear Programming Results, Ranging, Original Problem w/answers, Iterations, Dual, and Graph.

10. Select/Click **Linear Programming results**.

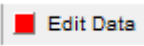
11. Select/Click **Ranking** results.

12. Select/Click **Original Problem w/Solution list** result.

13. Select/Click **Iterations** result.

14. Select/Click **Dual** result.

15. Select/Click **Graph** result.

16. If it turns out that there are data questions that need to be corrected, click the button  on the toolbar or from the **File – Edit** menu.

17. Don't forget to save this work file with the **File - Save** menu or pressing the **Ctrl+S** key.

18. These outputs can be displayed simultaneously by selecting the **Window – Tile** menu, or in batches with the **Window – Cascade** menu.

The **Linear Programming** results display shows the calculation results.

The **Ranging** display, especially in the **Lower Bond** and **Upper Bond** columns, shows the maximum (minimum and maximum) limits on variable coefficients and on the value of constraints, where in the range of values between **Lower Bond** and **Upper Bond**, the addition or subtraction of the optimal solution value is

proportional (linear) with addition or subtraction of variable coefficients or constraint values.

The **Original Problem w/answer** display, showing the results of calculations and the problems they solve.

The **Iterations** display, showing the steps in the Simplex method, to solve the Linear Program Model problem.

The **Dual** display, showing dual primal problems or solving dual problems from primal problems, or vice versa.

The **Graph** display, shows graphically, the calculation results of the Linear Program Model. This view will only appear if what is being solved is a 2-dimensional problem (can be represented by a graph with the x and y axes).

The emphasis of learning on students is to analyze the numbers resulting from the processing of Quantity Method software data. Do not let students understand the learning model that is applied, but are constrained by analyzing the data.

The trial stage for students who are studying Operations Research courses for some of the problems in the Operations Research course on the Strategy for Using Quantity Method Software in the Development of Operations Research Courses with a Realistic Mathematics Educations Approach. This is done to try to apply the Operations Research learning.

From the observations of the lecturers who carried out the Realistic Mathematics Educations approach, especially the emphasis during 3 meetings, there were many inputs, responses and suggestions from students, some of whom stated that they strongly agreed and understood the material being taught with the teaching method used, but According to them, the subject matter of Operations Research is taught a lot, so the students feel that the time in learning is lacking, but because solving problems is assisted by using Quantity Method software, they are very satisfied with Operations Research course learning using the Realistic Mathematics Educations approach.

5. CONCLUSION

The use of Quantity Method software in data processing is very effective for students in solving the subject matter problems in the Operations Research course, making it easier for students to make decisions from each case they face. The learning approach used is Realistic Mathematics Education by applying contextual understanding to real situations, solving contextual problems with Quantity Method software data processing tools,

comparing and discussing answers, so that decision making is considered successful. With the results of the tests given to students, they have a score above the average of the standard of success in applying teaching methods. This learning method can be said to be successful, namely Operations Research Learning with a Realistic Mathematics Education approach assisted by Quantity Method software.

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