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Needs of Students and Lecturers on Linear Programming as an Instructional Strategy in Solving National Economic Problems

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This research is motivated by the difficulty of students in expressing economic problems in verbal and linear program languages. It is important to develop a linear program teaching material through realistic mathematic education approach with problem solving strategies with national character. This study aims to describe the needs of students and lecturers on the linear program teaching materials. this teaching material applies a realistic mathematics education approach to problem solving strategies. problem in this study relates to national economic problems. This research is mixed type of research design. Research instruments in the form of questionnaires and interviews. Subject of research 225 students and 7 lecturers. The results showed that linear program teaching materials are very important for students and lecturers. They get teaching material from the internet. The material they need is short, clear and the evaluation is in the form of a description. They need economic-based linear program teaching materials through realistic Mathematics education approach with problem-solving strategies with the national character. Based on the needs of students, it is necessary to arrange linear program teaching materials.

Keywords: linear program, realistic mathematics education, problem-solving, character building

INTRODUCTION

The teaching and to learning process in Indonesia concentrates on to learning objectives and to learning outcomes (Fauzan & Partners, 2002). Learning does not yet refer to the learning process (Sembiring, 2010). To learning objectives only focus on memorizing facts, concepts and computational aspects (Fauzan & Partners, 2002). Mathematical learning innovation strategy is still minimal, so that to learning achievement is low. For example, in the course of linear programming, students have difficulty expressing economic problems in daily life in verbal language and linear programming languages (Hidayat & Iksan, 2015; Baidawi et al., 2018). Students have difficulty because they do not understand the problem. students are not yet skilled in writing problems in Mathematics models of linear programs.

An alternative solution to students' difficulties in understanding the problem is applying it to learning with the Realistic Mathematics Education (RME) approach (Hidayat & Iksan, 2015; Laurens, Batlolona, Batlolona, & Leasa, 2017; Ndiung, Dantes, Ardana, & Marhaeni, 2019). The Realistic Mathematics Education approach views mathematics as an activity. Mathematics is an activity of

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finding solution to the problems, solving problems, and organizing the main problems related to daily life (Gravemeijer, 2008; Wahyudi et al., 2017; Laurens et al., 2017).

RME is a learning approach developed by Freudenthal's in 1971 which says that mathematics is part of human life (Freudenthal, 1971). RME has the following characteristics: 1) Using meaningful contexts, 2) Using models from real contexts to formal Mathematics, 3) Rediscovery of Mathematics concepts by students, 4) Student interactivity with teachers, and 5) Viewing mathematics as a subject connected (Bray et al., 2015). In another development, the characteristics of RME are, 1) students are more active in thinking, 2) context and teaching materials are directly related to the learning environment, and 3) the role of teachers is more active in designing teaching materials and class activities (Sembiring, 2010).

This activity can occur by giving problems to students. These problems are problems that students have become familiar within their lives. As a result of increasing student activity in realistic Mathematics to learning is the reduced domination of Educators. In this approach, the Educator functions more as a facilitator. To learning steps with the Realistic Mathematics Education approach namely, 1) Understanding contextual problems, 2) Explaining contextual problems, 3) Resolving contextual problems, 4) Comparing and discussing answers, and 5) Concluding (Sembiring, 2010;Gravemeijer, 2008; Wahyudi et al., 2017; Laurens et al., 2017a).

Arranging instructional materials for linear programs based on economic problems through the RME approach with problem solving strategies of national character needs to be done a preliminary study of how the needs of students and lecturers for linear program teaching materials. The question in this research is how the needs of students and lecturers in teaching linear programming in solving national economic problems. The purpose of this study is to describe the needs of students and lecturers on linear programming as an instructional strategy in solving national economic problems. The hypothesis in this research is whether students need linear program teaching materials in solving national economic problems. So this research is focused on the needs of students and lecturers on linear program teaching materials in solving national economic problems.

METHOD

This research is mixed type of research desaign. This research was conducted in 4 universities in the East Java Province of Indonesia. The population of this study was 480 students and 16 lecturers in four universities. The research subjects consisted of 205 students and 7 lecturers. The sampling technique is done randomly, from four classes from each university, two classes are taken. The research subjects are students who have taken linear program lectures and lecturers supporting linear program subjects. Research instruments in the form of questionnaires, and interviews. The questionnaire consisted of six questions for students and four questions for lecturers. Interviews were conducted with open ended. The data is obtained by giving a questionnaire to the needs of students and lecturers for teaching linear programming. Then the data are analyzed and concluded. Data analysis was performed by describing the answers from the questionnaire then the highest percentage of answers was taken and describe the needs of students and lecturers from the results of the interview. This research was conducted in 4 universities in the East Java Province of Indonesia.

FINDINGS

Student Needs for Teaching Materials Linear Program

Mahasiswa mengalalami kesulitan dalam menyelesaikan masalah program linear (Hidayat & Iksan, 2015; Baidawi et al., 2018; Muhamma Baidawi, Ruvita Iffahtur Pertiwi, 2019). Maka diperluakan suatu bahan ajar program linear yang dapat mempermudah mahasiswa belajar program linear. Oleh karena itu diperlukan suatu kajian kebutuhan mahaiswa dan dosen dalam menyusun bahan ajar program linear.

Table 1
Student Needs for Linear Program Teaching Materials

No	Question (+)	The Answer (-)	Total	%
1	What is your opinion of to learning linear programming?	very important	138	67.32
		Important	81	39.51
		Ordinary	7	3.41
		Not important	0	0
2	During this time, from which sources have you to learned linear programming?	Student worsheet	64	25.40
		Internet	67	44.97
		Electronic book	48	19.05
		Other	40	15.87
3	How do you think about to learning resources used in linear programming?	Interest	133	85.25
		Boring	30	14.71
		Ordinary	30	14.71
		Not focus on linear programs	4	1.96
		Other	7	3.43
4	Do you agree if there are special to learning resources (teaching materials) that can be used as a guide?	Agree	113	94,96
		Not agree	11	5.61
5	What kind of linear programming material do you want?	Teaching material that contains the nature of economic-based linear programs through a RME approach with problem-solving strategies with the national character	130	47.62
		Teaching materials that only contain the nature of linear programs	19	6.96
		Teaching materials that contain the nature of linear programming, examples of linear programming	45	16.48
		Teaching material that contains the nature of linear programming, examples of linear program problems, and practice questions	75	27.47
		Other	4	1.47
6	In your opinion, how to explain linear program material	short and tight	139	62.61
		Length and detail	57	25.68
		Many use foreign terms	10	4.50
		Other	16	7.21

Based on the table above, it can be explained that linear program to learning is very important for students. Linear program learning helps students model economic problems in everyday life into linear programming languages. They to learn linear programs sourced from the internet. They are interested in the to learning resources used. They need teaching material as a study guide. The teaching materials they need are economic-based linear program teaching materials through realistic Mathematics education approach with problem-solving strategies with the national character. The linear programming material they need is concise and clear.

To learning linear programs according to students

To study linear programs in lectures, linear program teaching materials need to be developed that make it easier for students to learn linear programs by following the development of problems in life today. Therefore, it is necessary to arrange linear program teaching materials by following the needs of students.

The problem of students in to learning linear programs can be seen from the results of the following interview,

Researcher : What do you think about linear programming?
Student : Sleepy sir ... a lot of the story gets confused.
Researcher : What books are you using?
Student : Forgot the father, yesterday was given a copy of the photocopied book by his teacher
Researcher : The textbook?

Student : Not the father, photo copied from power point, continue to form a group of teacher
Researcher : How about the linear programming book you need
Student : Just be brief, sir, students don't need to be too detailed.

The results of the interview can give an illustration that students feel bored when learning linear programs using only power points, let alone just photocopied from a power point. The lecturer should use linear program applications in teaching such as Geogebra, POM-QM applications, Matlab and so forth. Students also complain confused when solving story problems. The lecturer should familiarize learning by implementing problem solving strategies. Their boredom and confusion are caused by the lack of references used. This is consistent with the results of the questionnaire, 14.71% of students are bored in learning linear programs

In to learning linear programs students have formed groups. But the formation of these groups was not optimal due to the lack of interesting references and the lack of activity for them. The teaching materials they need are in the form of teaching materials that are concise, clear and easy to understand. This is consistent with the results of the questionnaire, students 62.61% of students were happy with the teaching material that was short and clear.

Lecturer Needs for Teaching Materials Linear Program

Questionnaire lecturer needs for linear program teaching materials were given to 7 lecturers supporting linear program subjects at 4 Universities in East Java. The results of the questionnaire can be seen in the following table 2.

Table 2
Lecturer Needs for Linear Program Teaching Materials

No	Question (+)	The Answer (-)	Total	%
1	How do you view the to learning of linear programs?	Very important	3	42.86
		Important	4	57,14
		Ordinary	0	0
		Not important	0	0
2	Are there economic-based linear program teaching materials through realistic Mathematics education approach with problem-solving strategies with the national character?	Nothing	6	85,71
		Exist	1	14.29
3	Do you agree if the instructional material for linear programs based on economic problems through a realistic Mathematics education approach with problem-solving strategies with the national character is used as teaching material for students?	Agree	7	100,00
		Not agree	0	0
4	According to you, what kind of evaluation is appropriate with linear program teaching materials?	Description	6	85.71
		Objective	1	14,29

Based on table 2, it can be explained that linear learning is important according to the lecturer. Linear Programming helps students make it easier for students to find solutions to optimization problems related to economic problems in everyday life. Teaching materials based on economic linear programs through the RME approach with problem solving strategies with national character have never been prepared. The lecturer agrees if the linear program teaching material is used as teaching material for students. The type of evaluation of the linear program teaching materials is expected by lecturers to have a description.

To learning linear programs in tertiary institutions according to the Lecturer

Based on the results of interviews in the field, linear programming learning is still conventional that is, lecturers explain concepts, give examples and provide exercises. From here to learn some students quickly understand concepts and some still don't understand concepts so that in solving linear program problems with graphical and simplex methods there are still difficulties. Students have difficulty in

modeling problems in daily life in a linear programming language. Therefore students must first be understood how to model problems in everyday life into a linear programming language.

Some lecturers have applied to learning by utilizing geogebra applications in solving linear program problems. There are obstacles in the field of students who do not carry laptops. To overcome this, a group was formed, for those who brought laptops could share with others. Interview with one of the lecturers at University D as follows,

Researcher : How about linear programming in class?
Lecturer : Usually, I explain using power points.
Researcher : Next?
Lecturer : Students work in groups, but are personally responsible.
Researcher : What book uses the book, sir?
Lecturer Old books, I also took from the internet

To learning by using power points is indeed efficient. But it depends on the material to be delivered and the characteristics of students being taught. If only using power points alone will reduce information and activities experienced by students in to learning linear programs. Moreover, the power point used is a photocopied. Students will get bored quickly. Then need to be given other references such as teaching materials and to learning resources from the internet. For example, electronic books, the use of geogebra applications, POM-QM, or Matlab.

Give linear programming problems that can be done in groups can train students to work together and interact with each other. Groups should be formed based on students' abilities so that the abilities of each group are homogeneous. Each student's answers in one group may provide students the same opportunity to copy the results of their friends' work. Then each student in one group should be given freedom in answering questions, but each student has the responsibility to solve the problem.

The use of old references does not provide new information for students in to learning linear programs. Old books can be used as a compliment. An update reference should be given to support the renewal of information obtained by students. Attracted and challenged students to learn linear programs. So students can associate and solve linear program problems that are relevant to current problems.

Linear program problems can be solved by using geoGebra software. The use of geoGebra software in to learning linear programs can make it easier for students to solve linear program problems. This software should be used after students master the concept of solving linear program problems.

Each student in each college has a different character. They need treatment according to their character. In to learning linear programs, students should first be understood about the concepts of linear equations, systems of linear equations, variables, sets, equation solving and linear inequalities. Then students need to be introduced to problems in daily life related to linear programming. Model problems in everyday life in a linear programming language. Problems in daily life are interesting to be used as learning material for students. Teaching materials should be arranged based on the student's character. The preparation of teaching materials made by following the character of students will be more easily understood by students.

Next, the researchers also interviewed the linear program lecturers at University A as follows,

Researcher : What problems did you face while teaching the linear program?
Lecturer : Our students have different characters, so to explain it is necessary to explain from the beginning, for example, they do not understand the variables, how to solve linear programming problems they are still experiencing difficulties. They have not been able to solve the problem when it is changed a little it is difficult, some can, 1 to 10. They do not have preliminary knowledge about the benefits of linear programs related to problems in everyday life.

Researcher	:	What teaching material do you use in teaching linear programming?
Lecturer	:	I make teaching materials myself, not according to standards, because they adjust to the abilities or characteristics of students. I take from references from books or the internet and the results of my lectures first. I use power point, take notes, add what needs to be added. It contained more problems in daily life.
Researcher		What is the linear program to learning approach that you apply?
Lecturer	:	I applied the teaching method by explaining, giving examples, and then discussing the exercises
Researcher	:	What is the ideal linear program teaching material according to you?
Lecturer	:	The ideal teaching material, in my opinion, every student has a handbook, lecturers need to explain, give examples, provide a variety of problems and are associated with problems in daily life.
Researcher	:	How do teaching materials relate to the values of character education?
Lecturer	:	Must be creative in discussing problems in everyday life in Mathematics models.
Researcher	:	How does it relate to fatigue?
Lecturer	:	When it comes to honesty, I don't have a picture yet.

Improving student understanding in to learning requires a to learning approach that is not monotonous. Lecturers do not always provide explanations, examples, exercises and discuss practice questions. But students should be taught to learn independently by being provided with adequate facilities such as teaching materials, the internet, and other references. Thus students will study independently. Teaching materials can teach students independently but the lecturer remains a facilitator in to learning for example, explaining if students need explanations. Give varied examples and practice questions related to problems in daily life. To in still character for students, moral messages are needed in teaching materials related to linear program problems.

Linear program teaching materials needed by students and lecturers in to learning linear programs

Based on the results of the questionnaire and interviews with students and lecturers. Linear program teaching materials are very important for them because they can solve problems in daily life, especially problems related to economics. Students get more to learning resources from the internet. With the internet, they can get more varied and up-to-date references (Baidawi et al., n.d.).

The teaching materials they use, according to them are normal because they depend on the instructor in designing learning. They agree with learning resources in the form of linear program teaching materials. They feel more directed to learning. The teaching materials they need are linear program teaching materials through the RME approach with problem solving strategies with national character. Teaching materials are equipped with example problems, problem solving problems and modeling linear program problems in daily life and then solved by graphical or simplex methods.

The material they need in learning linear programs includes, introduction to linear programming, linear program problems in the surrounding environment, solving linear program problems with graphical and simplex methods. The linear program teaching materials they need are concise, concise, and detailed. For example, the problem they need contains steps that are coherent and easy to understand. The evaluation they need is a matter of description. Thus students will more quickly understand the material

DISCUSSION

Learning linear programs in tertiary institutions still applies conventional methods. The lecturer explained the linear program material then gave examples followed by giving exercises. This method makes students bored and less active in to learning. This contradicts the opinion (Gravemeijer, 2008)

that sees Mathematics as an activity, meaning that Mathematics is an activity to look for problems, solve problems, and organize the problems related to daily life.

So that students can to learn linear programs with activities looking for problems, problem-solving, and organizing problems related to daily life, the realistic Mathematics education approach isappropriate. By following opinions (Sembiring, 2010) relating to the steps of to learning with the RME approach namely, 1) Understanding contextual problems, 2) Explaining contextual problems, 3) Resolving contextual problems, 4) Comparing and discussing answers, and 5) Concluding.

Students do not have prior knowledge about the linear program, so the lecturer still needs to build on the student's an initial knowledge by preparing teaching materials that are by following student to learning development. The actions of the lecturer are by following the opinions (Baidawi et al., 2016) saying that to to learn a concept, students must have prior knowledge. For example, in to learning linear programs, students are required to already have an initial knowledge about linear equations, linear inequalities, solving problems of systems of equations and linear inequalities. If students already have this an initial knowledge, students will find it easier to to learn linear programs.

The teaching materials used by students in to learning linear programs are less up-to-date. The book has been used for the past fifteen years. They also make use of photocopies of power points. They to learn and do exercises from the lecturer summary in the form of power points. This makes students bored and tired of to learning linear programs. Therefore it is important to arrange a linear program teaching materials that enhance their to learning activities. They need teaching materials that link linear program problems with daily life, which involve students in to learning and the values of the national character. Teaching material with the RME approach has the potential to involve students in Mathematics to learning, improve their problem-solving skills, motivation, and self-confidence (Bray et al., 2015; Laurens, Batlolona, Batlolona, & Leasa, 2017). So that students and lecturers are in dire need of instructional materials based on economic linear programs through realistic Mathematics education approach with problem-solving strategies of the national character.

CONCLUTION

The results showed that students did not have preliminary knowledge about the linear program, so the lecturer still needed to build on the student's initial knowledge by compiling teaching material by following students to develop learning. Teaching materials used by students in learning linear programs are less sophisticated. Then it is necessary to arrange a teaching material that connects the problem of linear programming with daily life and the values of national character. So teaching materials based on economic problems linear programs through RME with the strategy to solve problems with national character are needed by students and lecturers.

SUGGESTIONS

Learning linear programming in class should be emphasized on to learning activities. For this reason, a teaching material is needed that makes students do activities in to learning linear programs. Linear program teaching materials should include an activity that can recall students' an initial knowledge in to learning linear programs. This will enable students easily to learn and solve linear program problems. Teaching materials need to be linked to economic problems in daily life by paying attention to the character of the nation.

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