

The Portrait of Learning the Linear Program in Indonesian Universities

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Abstract. The purpose of this study is to describe the portrait of learning the linear program in Indonesian universities, especially in East Java. Data was taken from several universities in East Java through questionnaires and interviews. Research results show that the linear program in some universities has implemented cooperative methods yet utilized less-than-current sources. As a consequence, students experienced difficulties in the linear program due to the lack of references which affect the students' lack of the required knowledge, even though the existing linear programs have used the computer as the media in their learning process. Based on the findings, learning resources are needed to ease the students in the linear program by paying attention to the prerequisite knowledge and motivating the students to cope with problems in daily life.

Keywords: *teaching materials, learning, linear program, Indonesian universities.*

INTRODUCTION

Linear program in Indonesia, especially in East Java, needs development. Linear program literature is not up-to-date and less relevant to current developments in terms of knowledge and technology. This is in line with the opinion [1] that linear program literature is difficult to find. Students have difficulty in defining problems into mathematical models. The learning strategies applied by lecturers fail in defining problems into mathematical models. Thus students have not gained any benefits from the linear program yet.

Based on the observations in the field, the linear programs applied conventional learning, namely lecturers explain concepts, provide examples, and provide training. The conventional learning model causes students not understand the concept so that they have difficulty in solving linear program problems with the graph method and the simplex method. This is in accordance with the opinion [1] that the simplex method material requires reasoning and communication skills to understand. In addition, [2] the students' background knowledge was low, students did not understand the linear program questions, and students did not have the willingness to learn independently.

Regarding those phenomena, teaching materials which can facilitate students in linear programs are urgently needed [3], especially teaching materials that

are relevant to the current situation (up to date). Learning will be more fun if the materials and the learning activities are integrated with the real-life condition [4]. In fact, the problem of linear programs is closely related to the economic problems faced by the students, for instance, the problem of buying and selling, production problems, transportation problems, and so forth. Learning that is associated with everyday life is called realistic learning. In mathematics education, it is called realistic mathematics learning. Realistic mathematics learning could improve the students' activity and the quality of learning [5].

Students will be more challenged in increasing their mathematics understanding by being given problem-solving questions [6]. Besides, problem-solving questions can foster students' awareness and critical thinking [7]. The characteristics of problem-solving questions are dealing with important problems, requiring high-level thinking, developing conceptual, providing opportunities to assess difficulties, using different strategies, and providing opportunities for students to practice discourse skills and mathematical ideas [6].

Character building is also important to be integrated into mathematics learning. The phenomenon of decreasing national character in Indonesia needs to be given an alternative solution through mathematics education [8]. The character of mathematics could be achieved by giving moral messages in mathematics teaching materials. Realistic mathematics learning is relevant to character building [9]. The character values includes an attitude to trust in God, respect knowledge, respect for others, respect for oneself as perfect beings, respect for mathematics as history and civilization, respect critical thinking to convey ideas, be careful, work hard, have willingness to solve problem, be discipline, and be responsible consistently [8].

METHOD

This research is a descriptive qualitative study. Data is retrieved through interviews with students who take linear program subjects and lecturers who apply linear program subjects. Data collection was taken from several universities in East Java, Indonesia.

RESULT

Several universities in Indonesia have implemented linear programs using GeoGebra applications. However,

some students do not have supporting facilities such as a laptop, so learning is formed in groups. Each student in the group is responsible for the results of his work. The results of the interview with one of the lecturers of the linear program at MDR University as follows:

- Researcher : How do you apply for linear programs in the classroom?
- Lecturer : I usually explain using power point, then give group assignments. Each student submits the results of his work. This is intended so that each student in each group has a responsibility with the assignment.
- Researcher : What kind of textbook do you use in the linear programs?
- Lecturer : I use books published by the State University of Malang.
- Researcher : Which one?
- Lecturer : In the past, I took it from the internet. Ms. Ira almost every year uses Geogebra, keep asking the students to look for questions, but the problem is not standard linear program problems.

Learning using powerpoint is considered efficient. Nevertheless, it depends on the material to be delivered and the characteristics of the students being taught. The single use of powerpoint will reduce information and activities experienced by the students in linear programs. Mathematics is an activity [10], meaning that mathematics is an activity to find problems, solve problems, and organize issues related to everyday life. Accordingly, learning linear programs is looking for problems in everyday life then modeled them in linear program languages and solved by a graph or simplex methods [11].

The powerpoint used by the lecturer is a copy of the powerpoint. As a result, students get bored easily and are not enthusiastic about learning. Providing learning resources that make students interested and challenging in learning is necessary, including references or teaching materials which relate to the students' daily lives. This can be done by applying learning with a realistic mathematics education approach [12]. Learning the linear programs can be linked to economic problems that exist in the life around students. Economic problems could be in the form of production problems in the industry, buying and selling problems in traditional markets, or transportation problems around students.

References or learning resources can be enriched with digital literacy. This literacy is obtained by providing links from the internet [13], either in the form of electronic books, videos, or an application. Electronic books are in the form of material about linear programs. Applications are in the form of software that can solve linear program problems such as GeoGebra, Matlab, maple, or POM. Videos are in the form of instructions for solving linear program problems using the application. With this literacy, students would be easier to learn linear programs.

Giving linear program assignments in groups can train students to cooperate and interact with each other [14]. The group should be formed based on the ability of students so that the ability of each group is homogeneous. The answers of each student in one group may provide the opportunity for students to copy the work of their friends. Then it is better for each student in one group to be given the freedom to answer questions, but each student has the responsibility to solve the problem.

The use of old references proven not provide new information for students in learning linear programs. Old books can be used as a supplement. The latest references to support the renewal of information obtained by students need to be given, so students can associate and solve linear program problems that are relevant to current problems.

Some universities use GeoGebra software to solve linear program problems. The use of GeoGebra software in linear program learning could help the students to solve linear program problems. This software should be used after students master the concept of solving linear program problems both graphically and simplex.

The following is the interviews between the researchers and the lecturers at UWM College related to linear programs:

- Researcher : What problems did you face while teaching a linear program?
- Lecturer : Our students have different characters; I have to explain the prerequisite knowledge first because they don't have the initial knowledge. They have difficulty when the problem is modified
- Researcher : What teaching materials do you use in teaching linear programs?
- Lecturer : We created our teaching materials by ourselves, not in accordance with the curriculum standard because we need to adjust to the abilities or characteristics of the students. We took several references, such as books from the internet.
- Researcher : What is the linear program approach that you apply?
- Lecturer : I apply the teaching method by explaining, giving examples, then discussing the exercises.
- Researcher : What is the ideal linear teaching material, in your opinion?
- Lecturer : The ideal teaching material, in my opinion, every student has a handbook while the lecturer needs to explain, give an example, give a variety of problems and be associated with problems in daily life.
- Researcher : How does the teaching material relate to character building values?

Lecturer : The students are expected to be able to be creative in discussing problems in everyday life in mathematical models.
 Researcher : How does it relate to success?
 Lecturer : About honesty, I still don't have a picture.

Every student in each college has different characteristics. They need treatment that is in accordance with their respective characters. In linear programs, students should be better understood about the concepts of linear equations, systems of linear equations, variables, sets, completion of equations, and linear inequalities [11]. Then students need to be introduced to problems in daily life related to linear programs.

Teaching materials which relate to everyday life problems will attract students in learning linear programs. Further, the teaching materials can be enriched with references from the internet and other books. Teaching materials should be arranged based on students' character since it could help the students to understand.

Linear program teaching materials that are desired by linear program lecturers stated in Table 1.

Table 1. Linear program teaching materials needed by lecturers

Question	Recommendation	Total	Percentage
What do you think about linear learning programs?	Important	4	57.14
Where did you get linear program teaching materials?	Textbook	6	80.29
Do you agree that the linear problem-based linear program teaching materials through a realistic mathematics education approach with problem-solving strategies of national character are used as teaching materials for students?	Agree	7	100
Is the content suitable for teaching materials developed in linear program learning?	Presentation of linear program material	7	100
	Linear program problems in everyday life	7	100
	sample problems and solving linear program problems	7	100
	problem solving problem	7	100
	searching for linear program problems in everyday life	7	100

Improving students' understanding of learning requires a 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 providing adequate facilities such as teaching materials, internet, and other references. Thus students will learn independently.

Teaching materials can assist students learning independently, but lecturers remain as facilitators in learning, for example, explaining when students need clarification. To instill character to students, we need moral messages in teaching materials related to linear program problems.

The portrait of linear programs according to students Linear programs in lectures need to be developed to facilitate students in learning the programs in accordance with the development of problems in today's life. Therefore, it is necessary to compile a linear program teaching material that is in line with the students' need.

Students' problems in linear program learning can be observed from the following interviews:

Researcher : What is your opinion about linear program learning?
 Student : Sleepy Sir. I got confused with a lot of explanations given.
 Researcher : What books do you use?
 Student : I forgot. It was copied materials provided by the lecturer.
 Researcher : A textbook?
 Student : No Sir, it was copied from the power point presentation.

The results of the interview can illustrate that students feel bored when learning linear programs using power points and the copied materials of the power point. They also complained of being confused in understanding the given explanation and feeling bored and confused due to the lack of references used. The results of a portrait questionnaire of linear program learning are illustrated in Table 2.

Table 2. Portrait of linear program learning for students

Question	Recommendation	Total	Percentage
What do you think about linear program learning?	Very important	89	70.63
During this time, from what sources do you study linear programs?	Internet	67	44.97
What do you think of the learning resources used in linear program learning?	Interesting	104	85.25
Do you agree if there are special learning resources (teaching materials) that can be used as guides?	Agree	113	94.96
What kind of linear program teaching material do you want?	Teaching materials that contain the nature of economic-based linear programs through a realistic mathematics education approach with national character-solving strategies are equipped with examples of problems, problem solving problems and the task of finding linear program problems in daily life and solved by graph methods or simplex methods.	74	64.61
What materials are suitable to be presented in linear program teaching materials?	Examples of Resolving Linear Program Problems with Graph Methods	74	64.61
According to you, how to explain the program material	Short and solid	84	64.62

In linear programs, groups have been formed. But the formation of these groups is not optimal due to the lack of interesting references and the lack of activity for them [1]. The teaching materials they need are teaching materials that are concise, clear, and easy to understand.

CONCLUSION

Learning linear programs in Indonesia is still not ideal. References used by lecturers and students are not up to date. Books are usually in the form of photocopies

of old books and books arranged by lecturers themselves. References are in the form of photocopies from the lecturers' power points, so it makes the students feel bored. Some lecturers have taken advantage of GeoGebra applications, but there are still problems with students who don't have laptops. Learning has been done in groups but still has minimal references, so the discussion is monotonous. Teaching materials needed by students are in the form of teaching materials that are rigged and accompanied by examples of problems and the solutions. The problem raised was related to the daily lives of the students.

Learning linear programs should use up-to-date references by using teaching materials that facilitate and foster student interest in learning linear programs, using software that can help students to complete a linear program, or giving digital literacy to students so that they have many references.

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