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Improving Mathematical Problem Solving of Linear Programs Through Blended Learning Web-Centric Course Model

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Raudatul Husna
Dosen IAIN Langsa, Indonesia
Contributor Email: raudatulhusna.cesp@gmail.com

Abstract
Initial observations given to students showed that the skills to solve math problems were still very low. The low mathematical problem-solving skills of students are due to not being trained to solve math problems. In addition, educators minimally apply varied teaching strategies in every activity of the learning process. The purpose of this study is to examine whether there is an increase in mathematical problem-solving skills in linear program courses for students using blended learning based on web-centric courses. Researchers used quasi-experimental research. The research population is all students of Mathematics Education IAIN Langsa even semester. The research sample was fourth-semester PMA students totaling 40 people. The data collection technique used essay questions. The results of data collection were analyzed by ANOVA. After the data was analyzed using the ANOVA test, this resulted in 0000 <0.05 the level of significance Ho was rejected. From the test results, there is a difference between students whose learning process uses a web-based blended learning model from Centri Course and conventional-based learning. It can be concluded that students who are guided using the Centri Course web-based blended learning model show an increase in completion skills.

Keywords: *Blended Learning, Mathematical Solving Ability, Linear Programming, Web-Centric Course.*

Abstrak
Observasi awal yang diberikan kepada peserta didik menunjukkan bahwa keterampilan menyelesaikan persoalan matematika tergolong masih sangat rendah. Rendahnya keterampilan penyelesaian masalah matematis peserta didik dikarenakan tidak terlatih untuk memecahkan masalah matematika. Selain itu pendidik minim menerapkan strategi pengajaran yang variatif dalam setiap kegiatan proses pembelajaran. Tujuan dari penelitian ini yaitu mengkaji apakah terdapat peningkatan keterampilan penyelesaian persoalan matematika pada mata kuliah program linear para peserta didik dengan menggunakan blended learning *berbasis web centri course*. Peneliti menggunakan penelitian quasi eksperimen. Dimana yang menjadi populasi penelitian seluruh mahasiswa Pendidikan Matematika IAIN Langsa semester genap. Sedangkan sampel penelitiannya mahasiswa PMA semester IV yang berjumlah 40 orang Teknik pengumpulan data menggunakan soal essay. Hasil pengumpulan data dianalisis dengan Anova. Setelah data dianalisis menggunakan uji Anova, Hal ini menghasilkan 0000 < 0.05 tingkat signifikansi Ho dinyatakan ditolak. Dari hasil pengujian adanya perbedaan antara peserta didik yang proses pembelajarannya menggunakan model pembelajaran blended learning berbasis web dari Centri Course dengan pembelajaran berbasis konvensional. Dapat ditarik kesimpulan bahwa peserta didik yang dibimbing menggunakan model pembelajaran model pembelajaran blended learning berbasis web dari Centri Course menunjukkan peningkatan keterampilan penyelesaian masalah matematika yang lebih tinggi dibandingkan dengan peserta didik yang menerima pembelajaran konvensional.

Kata Kunci: *Blended Learning,* Kemampuan Pemecahan Matematis, Program Linear, *Web Centric Course*

A. Introduction

Linear programming is a branch of mathematics used in finding the optimum value of a linear inequality. This science is very important in finding the optimum value calculation of linear inequality problems. At the college level, linear program material is presented to students in the form of its own course. Linear program is an important science to be learned by students in applying computer programs, students must be able to solve a case by optimization. In addition, linear program material is material that learns about a technique for solving optimization problems using inequalities and linear equations. Optimization problems that use inequalities and linear equations are widely used in activities. So it requires excellent mathematical problem-solving skills.

Mathematical problem-solving skills are the skills of students in solving problems systematically according to indicators determined by their ability to solve mathematical problems related to their daily activities. Some important ability in preparing for mathematics learning is solving mathematical problems. Thus, the ability to solve mathematical problems is very important in the process of teaching mathematics. Mathematical problem-solving skills are the most important part of the mathematics curriculum because learners use their experience skills and knowledge in solving non-routine problems which are very complex cognitive abilities for mathematical problem-solving.

Understanding the problem, developing a solution to the problem, implementing the solution to the problem, and rechecking the results are the indicators. As a result, solving math problems represents a certain level of intellectual activity. By applying previously acquired knowledge, learners should have as many opportunities as possible to take initiative and consider problems systematically. "The ability to solve these mathematical problems must be done by applying mathematical problem-solving

procedures is called the ability to solve mathematical problems" (Pane & Elindra, 2019).

However, in reality, students are still lacking opportunities to improve their ability to solve math problems, in other words, their ability to solve math problems is very low. Following the initial research test given a mathematical problem, it appears that the ability to solve a mathematical problem in the linear program course is low. This condition shows that many students face obstacles in understanding the meaning of the problem, planning how to solve the problem and that the calculation method or approach that students suggest is not correct, and students do not evaluate written answers. Following the results of research by Hidayat & Sariningsih (2018) from the initial results of learning decision-making skills obtained by 32 students; only 18 students completed the training, which is 56.25% of the total number of students". The lack of formation of mathematical problems has an impact on the inability of students to solve these problems. Therefore, learners must be taught and trained in mathematical problem-solving skills through the right learning model. Learners need these skills to be ready to solve mathematical problems.

One of the causes that contributes to the lack of maximum ability of students to solve mathematical problems because the learning used by the teacher cannot stimulate students' thinking, and does not help students to solve math problems, do not want to ask questions about the material being explained or do not understand the material being explained, As a result, there is a difference in learning between students and teachers. Students do not have the ability to solve math problems. Most mathematics teachers start the lesson by explaining basic mathematical concepts, giving examples of problem solving and question and answer, and solving problems related to topics have been learned in the classroom (Nurfitriyanti, 2016).

Thus, it is important to determine an instruction that can support learners to solve mathematical problems better. Blended learning can be a strategy used by teachers to organize learning preparation by taking

sequential stages to achieve learning objectives. "The teaching system that combines offline and online learning is called blended learning" (Dwiyoho, 2018). "The online-based learning process is a learning process that uses an online system by using means such as multimedia technology, virtual classes, online video streaming, and email" (Kuntarto, 2017). Web-centric course is a combination of online and conventional learning processes where learning materials are delivered online and conventional, as for the advantage of Web-centric course is that students easily choose relevant learning resources following the direction of the educator to become a topic of discussion during learning.

The purpose of blended learning is to help learners improve their abilities according to their learning styles, provide more time for self-study, and create a more flexible learning schedule. Blended learning model presents many opportunities for learners to be free to learn and interactive experiences in face-to-face classes, Online classes provide a wide range of knowledge through multimedia content can be used online anywhere and anytime (Husamah, 2014). Based on these views, the purpose of blended learning model is to help students develop mathematical problem solving skills.

The Blended Learning Web Centric Course model combines conventional and online learning. Some materials are delivered through the internet and some are delivered face-to-face. In the Blended Learning Web Centric Course learning model, educators can guide learners to explore a topic through the website they create. Learners can search for other learning materials on relevant websites. In offline learning, learners and educators discuss learning materials that have been searched on the internet. The advantages of Blended Learning Web Centric Course model are growing learners' learning motivation, interaction between learners and educators, getting more autonomy in their learning and improving their math skills.

Based on the presentation of the results of previous research, namely "YouTube-Based Blended Learning Model to Improve Students' Mathematical Problem-Solving Ability at SMPN 8 Padangsidipuan states using a YouTube-based blended learning model has improved students' mathematical problem-solving ability at SMPN 8 Padangsidipuan with (Silaban et al., 2019)". In line with the article "The Effectiveness of Blended Learning suggests that blended learning makes a significant contribution to improving learning outcomes than conventional learning and online learning (Abdullah, 2018)". The research paper "shows that students do better on math assignments using the blended learning model in the title of the paper, the application of the blended learning model to improve problem-solving skills in the statistics method II course (Payadnya et al., 2021)".

Based on the description above, what distinguishes this research from the previous one is that the researcher uses a blended learning model Web Centric Course class blog created by the researcher himself to teach the material in linear program lectures. In addition, researchers used the ANOVA test to conduct a research analysis. The purpose is to determine the improvement of students' mathematical problem-solving skills in linear programming courses taught through the Blended Learning Web Centric Course learning model.

B. Method

This study used quantitative methods with quasi-experimental. Quasi-experimental is essentially defined as a method by which a cause-and-effect relationship can be established from a treatment (Sugiyono, 2016). The population is a certain characteristic determined by the researcher to see the quality of the object of research to study and draw conclusions (Sugiyono, 2016). The sample in the study was 4th-semester students of units 1 and 2 of the Mathematics Education Study Program of IAIN Langsa as many as 40 people with purposive sampling, the reason for using purposive sampling is

because it uses qualitative research or research does not generalize (Sugiyono, 2016).

The method of collecting data sources in the study was in the form of giving test questions on mathematical problem-solving skills given before and after the test in both classes. The research instrument in the form of an essay test includes indicators of knowing the problem, designing solutions, finding solutions, and revising answers. Essay tests were given before treatment and after treatment. The following steps were used to analyze the data using SPSS 17 software: (1) testing the feasibility of the analysis through normality testing by Kolmogorov-Smirnov, (2) checking homogeneity using Levene's test, (3) testing hypotheses in research using analysis of variance (ANOVA) test.

C. Result and Discussion

1. Results

Through hypothesis testing using statistical analysis, there are differences in solving mathematical problems of students whose learning process is through conventional learning, students who receive a blended learning web-based course model tend to be better at solving mathematical problems in linear program courses. The steps of hypothesis testing are:

(a) Normality Test

Table 1. Normality Test

Learning Factors		KOLMOGOROV-SMIRNOV[A]		
		STATISTIC	DF	SIG.
GAIN_Solving	Eksperimen	.712	20	.691*
	Control	.697	20	.716*

Table 1. shows that the experimental and control groups both have a significance value higher than 0.05, respectively a 0.691 > 0.05 significance value of 0.716 > 0.05. From this analysis, it is declared normally distributed.

(b) Homogeneity Test

Table 2. Homogeneity Test

LEVENE STATISTIC	DF1	DF2	SIG.
3.194	1	38	.082

The table above shows the Levene value of 3.194 with a sig value. 0.082 0.05 means that the data of the two groups are homogeneous.

(c) Hypothesis Test

The test data showed that the groups with improved mathematical problem-solving skills were from a normally distributed population with homogeneous distributions for each pair of data groups. Therefore, ANOVA statistical analysis was conducted table 3 presents the overall results.

Table 3: Summary of Hypothesis Tests

SOURCE	TYPE III SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
CorrectedModel	.233[A]	1	.231	73.802	.000
Intercept	23.716	1	23.716	7.576	.000
Learning	.231	1	.231	73.802	.000
Error	.119	38	.003		
Total	24.066	40			
CorrectedTotal	.350	39			

the F coefficient of learning (experimental and control) is 73.802, and the significance level is 0.000 less than the significant limit of 0.05, at that time Ho is rejected. as shown in the normalized Anova gain calculation in Table 3. Compared to learners in conventional teaching, learners in the Blended Learning Web Centric Course model performed better in mathematical problems in linear program courses. In other words, learners who received conventional teaching had lower scores on solving math problems than those who participated in the Blended Learning Web Centric Course.

2. Discussion

The research hypothesis is that students taught according to the Blended Learning Web Centric Course learning model have superior math problem-solving skills than those taught with conventional learning methods. ANOVA test was used for statistical analysis of findings 0.000 is smaller than 0.05. The testing hypothesis Ho is rejected, the conclusion is that students taught according to the Blended Learning Web Centric Course learning model have superior math problem-solving skills compared to those taught by conventional learning methods.

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The implementation of the Blended Learning Web Centric Course model combines online and offline learning. In offline learning, the learning process uses a cooperative learning approach to solve problems presented by educators in the form of mathematical problem solving problems. In cooperative learning, students not only get learning from learners but also get learning from peers and have togetherness between each learner so that learning becomes fun, so that students are more actively involved in the process, foster a sense of unity among group members and create conditions that encourage more active learning (Rusman, 2013). While online learning implements learning by using various platforms including the institution's e-learning site, Google Classroom, applications for video conferencing such as Zoom and Google Meet, and Wattsapp group search applications can provide additional information to find learning materials for students.

The main purpose of the Blended Learning Web Centric Course learning model is to produce effective learning so that the learning process becomes optimal. The application of the Blended Learning Web Centric Course can realize education 4.0 and the Blended Learning Web Centric Course learning model assumes that students are independently involved in finding material and solving problems. Solving math problems can be improved through the blended learning model (Noviyanti et al., 2019). Renewal in the world of education aims to solve problems in the world of education so that graduates can compete with the times. The benefits of Blended Learning Web Centric Courses are more effective learning, improved learning outcomes, digital literacy training, and internet skills, tasks are presented more interestingly and flexibly and it is easier to monitor the progress of students (Alif, 2020). Whereas in the control class which is taught with conventional where the educator provides the material so that the lack of practice in solving math problems.

D. Conclusion

Based on the results of the analysis with the Anova test, the p-value is $0.000 < 0.05$, stating that the Ho hypothesis (null hypothesis) is not accepted. Therefore, linear program lectures through the Blended learning-centric Centric Course learning model have high mathematical problem-solving skills lectures with conventional learning models.

The researcher found recommendation findings, among others: By using a Blended Learning Web Centric Course, students will become more skillful in solving mathematical problems, foster a pleasant environment and support learning, increase the spirit of self-learning, and become better person in solving problems.

Some suggestions require the attention of all interested parties regarding the use of the Blended Learning Web Centric Course model in teaching mathematics. the suggestions are as follows; (1) Teachers of mathematics courses Blended Learning Web Centric Course Model on

students' Linear Program mathematical problem solving skills. Thus, this approach needs to be further developed in the field so that students are taught mathematical problem-solving through the process of understanding the problem by knowing the asked and known in the problem presented, planning the problem solving process, solving the problem presented, and revising.

Lecturers must have problem-solving many abilities, such as leading discussions with the audience and drawing conclusions. The absolute requirement that an educator must have is the ability to master the teaching material. More interesting learning materials are needed to support the successful implementation of the web-based blended learning course model, educators spare When educators create and manage e-learning systems that include material development, preparation of assessments, and implementation of exams, they must also create digital guides to be a reference for learners to carry out face-to-face learning processes, (2) For future research, it should be combined with thorough research on other unknown elements for future investigations. (3) The specific model of the Blended Learning Web Centric Course Model used in teaching should be socialized to related educational institutions to improve students' mathematics ability, especially their ability to solve mathematical problems.

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