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ENHANCING STUDENT ENGAGEMENT THROUGH OPTIMAL CLASS PROVISION: THE POTENTIAL OF THE SIMPLEX METHOD IN MOVING CLASS SYSTEMS

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Abstract: Implementing Moving Class at SMAN 1 Panji aims to make students focus on studying subjects of interest that will be used for college entrance tests. The number of students who do not get classes in the subjects of interest because the provision of courses in the implementation of Moving Class has not been optimal causes many students not to be enthusiastic about learning. By considering these problems, it is necessary to have a literature review on the simplex method to know whether or not the simplex method can be used as a method in optimizing the provision of classes in the implementation of Moving Class so that all students get courses according to their interests and students will be more enthusiastic in participating in learning. A literature review is used to determine whether or not the simplex method can be used to assess the provision of classes in implementing Moving Class. In previous studies, the simplex method was widely used to optimize production, profits, and also a combination of production because it has several constraints and linear limits, so it was concluded that the simplex method could be used to optimize the provision of classes on the implementation of Moving Class because it also has linear constraints.

Keywords: Simplex Method, Class Provision, Moving Class, Linear Program.

INTRODUCTION

Education is one of the important factors in determining the quality of human resources and the progress of a nation. A good educational process will give birth to a generation that has creative, innovative ideas in the dynamics of this increasingly modern era (Lince, 2022). Indonesia uses the Merdeka Curriculum, which focuses on fun learning to support the realization of education that can give birth to quality generations. Moving class is an activity program that supports the quality of student learning in the Merdeka Curriculum, where students can choose their subjects according to their respective interests (Rahman et al., 2024). With the Moving class program, teachers will have a very high opportunity to create student activeness in participating in learning activities in the class they choose according to their interests (Yulhakim et al., 2023).

Implementing the Moving class learning system is one of the policies at SMAN 1 Panji. The moving class system is an adoption of the learning system applied in universities. In addition, the moving class system is a full activity system because students' learning activities are needed. In contrast, before the moving class system, a teacher must actively enter the classroom to carry out the learning process. Still, with this system, students are required to be active to follow the learning process, because when changing class hours or subject matter

it is no longer the teacher who is looking for classes but students who must actively look for classes, while the teacher is waiting in the classroom. So, implementing the moving class learning system requires students to learn actively. Students' activeness will be seen intellectually and emotionally so that they can play a role and participate in learning activities(Saputro, 2019). In addition, Moving classes with the aim that students can explore their subject areas according to their interests and talents, which lead to majors in Higher Education(Rahman et al., 2024). Therefore, students in grade 10 begin to be mapped in the direction of college majors and must last until grade 12; in grade 11, students have explored elective subjects by the direction of the College major. Students are not required to take all existing subjects. However, students choose subjects according to their interests and talents to make it easier for students to determine their continued studies.

In reality, implementing the moving class program at SMAN 1, Panji is often faced with problems that make this program less conducive. First, the educational infrastructure in the school is inadequate, and there is a lack of trained educators and facilitators, which results in limited class provision. The limited availability of classes meant that some students did not get the classes they were interested in. Secondly, the significant change in learning patterns from the traditional model to the moving class model also requires extensive adaptation from all relevant parties, including teachers, students, parents, and educational institutions.

Based on the problems that occur in the Moving class learning at SMAN 1 Panji, namely the existence of some students who do not get the class according to the subjects they are interested in, it is necessary to find a plan to optimize the provision of courses in the implementation of Moving class so that all students get the class according to the subjects they are interested in. To help solve the problem of SMAN 1 Panji in maximizing the provision of courses in the implementation of moving classes, the simplex method will be used, which is a method in the linear program. A linear program is one of the branches of science in the field of operations research that has different methods or problem-solving techniques according to the needs of the problem (Goli & Nasseri, 2020). In this case, the simplex method is suitable for decision-making in this problem. The simplex method is one of the solution techniques in linear programs that is used as a decision-making technique to find the optimal value (Budianti et al., 2020).

Several previous studies also use the simplex method as a decision-making technique for finding the optimal value. Such as research conducted by Aini et al., (2021) who got the results of research that the amount of production of seblak noodles and seblak eggs is 3 servings, with a maximum profit of RP.750,000.00. Research by Untari et al., (2023) with the results of the study should produce jamu beras kencur with small bottles (250ml) produced as many as 106 bottles, jamu beras kencur with large bottles (600ml) produced as many as 4 bottles, and will get a maximum profit of Rp155,600.00. In research conducted by Ambarsari et al., (2024) where the results showed that the maximum profit per month obtained was IDR 750,000.00 with a focus on producing large-size tempeh only. Research conducted by Lina et al., (2020) with the results of research the maximum profit to be obtained is Rp 494,000 every day. The results of research conducted byAningke et al., (2020) is the maximum profit of Rp 1,098,300 per one production of a combination of the production quantities of Tempeh Chips, Eggplant Chips, Abon Papaya, and Shrimp Crackers. These studies are examples of previous studies that used the simplex method to optimize production

for maximum profit. In their research, Khamid & Suyatno, (2021) with the results of applying the simplex method in optimizing the cost of using heavy equipment in cut and fill work for excavation work in combination 4 with type 2 excavators with a total of 3 units, type 1 dump truck with a total of 6 units, and type 1 bulldozer with a total of 2 units, with a total cost of Rp.4,955,077.4..955,077,432 and research conducted by Pangestu et al., (2022) obtained results for the optimal alternative tool in embankment work, namely alternative combination 4 using excavator type 2 number of 2 units, dump truck type 1 number of 3 units, bulldozer type 1 number of 1 unit, vibro roller number 1 unit, and water tank truck number 1 unit, with a total cost of Rp.3,403,048,016. In their research, they used the simplex method to determine the design of the use of limited raw materials. In addition, research conducted Jamal & Sari, (2022) which also uses the simplex method to determine profits and assignments in MSMEs with the results of sales research will get maximum profit if selling 10 packs of Kencur Fried Rice, 4 packs of Kecap Fried Rice, and 13 packs of Boiled Noodles.

The above research has discussed the simplex method used to determine profits and determine the optimal design and assignment so that a business can get maximum profit. Although previous research discusses the use of the simplex method as a decision-making technique, it is only focused on determining production and business profits. However, few have explored the effectiveness of the simplex method for solving solutions in the needs of places and classes, especially in the world of education.

The novelty in this research lies in the utilization of the simplex method as a decision-making technique in determining the provision of classes in the implementation of moving classes so that all students of SMAN 1 Panji get courses that are by the subjects of interest. Therefore, based on the problems that occur at SMAN 1 Panji, the researcher will carry out research with the title "Minimization of Class Provision in the Implementation of Moving Class Class Class 11 of SMAN 1 Panji Using Simplex Method" to determine the number of classes that must be provided so that all students of class 11 of SMAN 1 Panji get courses according to the subjects of interest.

METHOD

Systematic literature Review is a research approach conducted to identify, assess, and synthesize the results of existing research in a particular field systematically and transparently. In this research, the first step is to formulate the problem to detect problems in the school. The results of this step were carried out by interviewing the school, namely the waka curriculum of SMAN 1 Panji (Mrs. Susi Agustini, S. Pd). The next step is to look for references to review the literature to solve the problem from publication in 2020 to the present, namely 2024. After obtaining information or data such as the number of teachers, students, and specialization subjects, the number of classes that will be provided for moving classes can be determined using the simplex method.

The simplex method is a solution method used for linear program problems with more than 2 decision variables. It is one of the solutions of the linear program, and it involves finding the solution using the iteration path, namely determining the feasible point of the goal to be achieved with the help of tables until the optimal solution is obtained.

The next step was to collect article sources related to moving class and the simple plex method.

Researchers selected 10 sources of articles related to the keywords used.

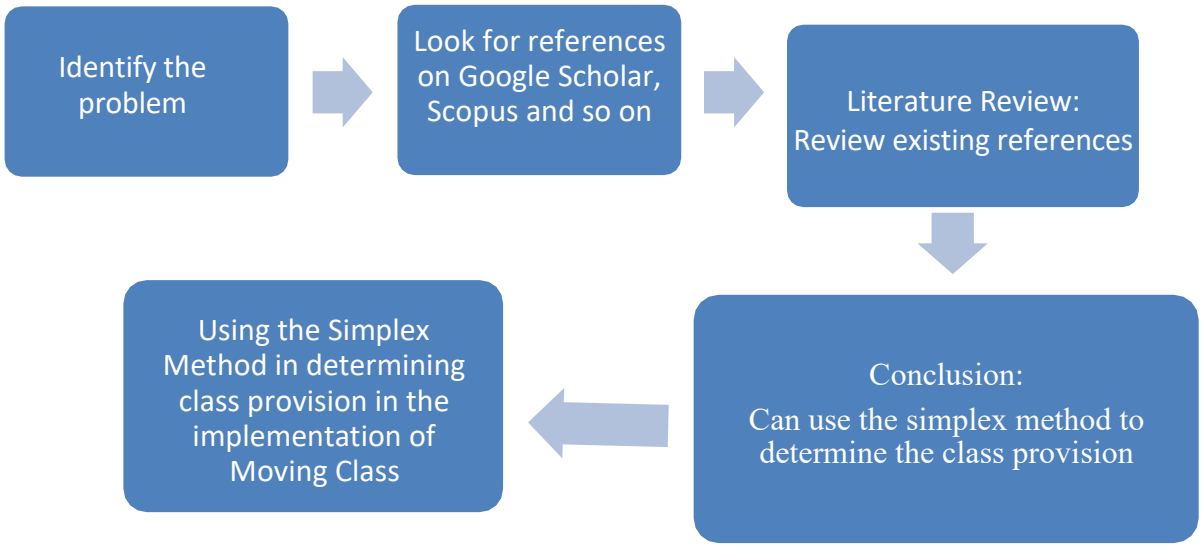

Figure 1. Steps of SRL

RESULT

In this literature review, researchers analyzed 10 articles published over the past 5 years related to the simplex method. The results of the literature review analysis are as follows.

Table 1. Literature Review Articles

No.	Name and Year	Research Article Title	Journal	Results
1.	Azizah et al., (2023)	Analysis of the Application of Simplex Linear Programming Method in Martabak Home Industry	Journal of Trends Economics and Accounting Research	The simplex method is used to determine the maximum profit on martabak production.
2.	Rusdiana & Istiono, (2023)	Application of the Simplex Method to Maximize Revenue	Journal of Economics and Business	The simplex method helps maximize Bella Bakery's profit with the optimal result of Rp200,000 through POM-QM software.
3.	Putri, (2021)	Analysis of Shrimp Distribution Cost Minimization Using Linear Programming Assisted by QM for Windows Application	Thesis State Islamic University Raden Intan Lampung	Reduced shrimp distribution costs by 3.75% to IDR 72,187,500, indicating improved efficiency.

No.	Name and Year	Research Article Title	Journal	Results
4.	Rumetna et al., (2022)	Analysis of sales optimization using the simplex method in small and medium enterprises	Journal of Computer Science and Technology	The simplex method helps maximize the sales profit of Mr. Wartono's pentol and chicken satay with optimization results of Rp.4,000, - / production of pentol and chicken satay.
5.	Lestari & Muttaqien, (2023)	Cake product optimization model using the simplex method at Rosalina cake shop, Jatake branch	Journal Industrial Manufacturing	With the limited resources available, the simplex method can be used to maximize the profit of Rosalina bakery with the number of each product that must be produced, namely x1 (brownie cake) as many as 3.3333 cakes, and x2 (pandan sponge cake) as many as 8.6667 cakes. So that the maximum profit is obtained is Rp.93,999.9,
6.	Rumetna et al., (2021)	Optimization Using the Simplex Method in Small-scale Fuel Oil Businesses	Journal of Community Service in Science and Technology	The results of manual calculations and test results using POM-QM software can be used as a reference by Mr. Ruddy in determining the maximum profit from retail fuel oil sales every day. Other small businesses can also apply similar techniques to solve various problems faced.
7.	Rumetna et al., (2020)	Resource optimization for small-scale businesses amid a pandemic using the simplex method	Journal of Assessment and Application of Informatics Engineering	The Simplex method in linear programming (PL) is very suitable for use in resource optimization

No.	Name and Year	Research Article Title	Journal	Results
				calculations. And the use of information technology through POM-QM software for the Windows version 5 allows the calculation process to be faster and more accurate. Thus, this software can be used by small businesses to optimize their resources.
8.	Hani & Harahap, (2021)	T-shirt production optimization using the simplex method	Journal of Mathematics	By using the simplex method, the the maximum profit obtained is Rp. 6. 055, 556 when producing 44 pcs of T-shirt design A and 33 pcs of T-shirt design B by XYZ confection.
9.	Aini et al., (2021)	Optimization of food production profit using the linear program through a simplex method		Through the simplex method, it can be seen that the maximum profit that will be obtained by UKM seblak gaul bapak putra is Rp. 750,000 if it produces 3 servings of black noodles and black eggs.
10	Rastryana et al., (2023)	Implementation of the simplex method to obtain maximum profit at the cantika cake shop	MEA Scientific Journal (Management, Economics, and Accounting)	By applying the simplex method and the POM-QM program, Cantika store sales can calculate the achievement of maximum profit quickly and more efficiently.

Based on the results of the literature review analysis, according to the table above, there are 10 articles where the simplex method is more widely used in optimizing profits in a

business to maximize production to obtain maximum profit. The settlement process can be completed with the help of the Matlab application or POM QM.

In finding the maximum profit result in the simplex method, a minimum of 3 data in tabular form must be used as constraints. After determining the constraints, researchers can determine the objective function that will be maximized or minimized according to the research objectives.

Based on the results of the review of the 10 articles, no research still explains the application of the simplex method to optimize class provision. However, researchers can use the simplex method as a way to solve problems regarding class provision in moving class activities at SMA Negeri 1 Panji so that students get classes according to their interests. In this case, the number of classes, the number of subject teachers related to the moving class, and the number of students can be used as a constraint. With these constraints, we will obtain an objective function so that it can be known how many classes must be provided so that students can get courses according to their interests.

DISCUSSION

Based on the problems that occur in the implementation of the Moving class program at SMAN 1 Panji, the author took the initiative to help overcome these problems by conducting a literature review of 10 articles on the application of the simplex method to find out whether the linear program with the simplex method can be used as decision making in determining the provision of classes in implementing the Moving class learning program at SMAN 1 Panji so that students get courses according to the class they are interested in.

The simplex method is one of the techniques often used in decision-making to solve various problems related to production and optimal allocation of resources. Based on the analysis of 10 journals, we found similarities in utilizing the simplex method as an approach to resource optimization to achieve maximum results. This method is designed to handle problems with more than two variables. The simplex method is divided into two types, namely the maximization simplex method, which aims to obtain maximum profit, and the minimization simplex method, which aims to minimize costs.

The optimal solution in the simplex method can be determined manually, although this process is time-consuming. The optimal solution is determined by examining the extreme points (referring to the graph method) gradually through iterative calculations. Therefore, this process must be done carefully and through several stages known as iterations. In the simplex method, several terms are often used, such as iteration, non-base variable, base variable, solution or right value, slack variable, surplus variable, artificial variable, key column, key row, key number, entry variable, and exit variable. All these terms are important to understand as they will continue to be used in operational research.

As technology develops, determining the optimal solution in the simplex method can also be done technologically. Currently, many software applications can be used as a tool to help determine the optimal solution in the simplex method to calculate the achievement of maximum profit quickly and efficiently. Here are some software that is widely used, including:

1. POM/ QM for Windows
2. Microsoft Excel

3. Geogebra
4. MATLAB
5. SpeQ Mathematics
6. SPSS
7. Lingo Software
8. Lindo Software and others.

Of the software mentioned above, only two of them are most widely used in the simplex method by previous researchers, such as POM/ QM and MATLAB software. This is evident after the author analyzed ten journals; all the literature used software, such as POM-QM for Windows, to simplify the calculation iterations of the simplex method, ensuring high accuracy and efficiency in obtaining solutions. eight of them used POM-QM for Windows because it was considered the easiest to apply. However, reliance on POM-QM for Windows may cause bias in the research if the software has limitations or errors in data processing that are not anticipated. For this reason, it is necessary to be careful in using it. In addition to functioning as a tool to determine the optimal solution, the application is also used to compare the results of manual calculations to make the results obtained more accurate.

By the above problems, the simplex method can provide a stepwise solution to ensure that all constraints can be met, relevant to the optimal class allocation based on the lesson schedule. In this case, it is necessary to implement a web-based or mobile application that uses the simplex method for automatic class management in schools. In implementing the Moving Class learning program at SMAN 1 Panji, all students get classes according to the class they are interested in.

CONCLUSION

The simplex method is a widely used optimization technique for solving linear programming problems. In practice, it often solves problems much faster than the theoretical approach would suggest. In real life, besides being used in portfolios to maximize profit or minimize risk, the simplex method can also be applied in various fields, such as to optimize production by considering raw material and working time constraints, to determine resource allocation or distribution of goods and to solve shortest route or network allocation problems. So, the results from the literature show that the simplex method can be applied to optimization problems involving limited resources to maximize efficiency or minimize usage. The simplex method can also provide iterative solutions that ensure that all constraints are met and relevant to optimal class allocation based on class schedules.

This research still has room for further development. Therefore, it is recommended for future researchers to use other applications as comparison materials. The recommendation for further research is to develop a Moving Class optimization model by considering additional variables such as student transition time between classes, class equipment, and others.

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