PREDICTION OF MATERIAL REQUIREMENTS FOR VOCATIONAL PRACTICES USING THE MONTE CARLO METHOD (CASE STUDY AT SMK DWI SEJAHTERA PEKANBARU)

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ABSTRACT

Vocational High School (SMK), every practice always requires practice materials when the demand for practice materials is always the same between majors, so schools have difficulty in fulfilling them. To meet the needs of practice materials optimally. then we need a system of procurement of practicum materials which later the data will be processed using the Monte Carlo method with testing using PHP programming. The results of this study are predictions of optimal practicum material needs in the existing majors at SMK DWI SEJAHTERA, especially in this study in the TKJ department and the materials needed and the amount of practice materials needed. The accuracy rate is 97%. So this research is very helpful in predicting the need for practice materials used by schools in improving student practice services.

Keywords: Prediction, Simulation, Monte Carlo, Major

1. Introduction

In this study, a simulation method approach has been applied to evaluate the trend of changes in the NAV of mutual funds, then determine the weights on the valuation function to select the right portfolio of equity mutual funds (EMF) that can maximize MFI returns. While the contribution and special urgency in this research is to develop this method through MCS in conditions of economic recession due to global shocks(Azis, et al., 2021)

This particular type of learners needs to be treated differently from those of common senior high school students. Unfortunately, there is not even different content in the curriculum compared to those for all types senior high school in Indonesia. It is stated in the curriculum that the basic competencies are the same for SMA/MA and SMK/MAK. In fact, there are various types of SMK based on its concentration in Yogyakarta. Some of them are SMK with business and administration management, tourisms, computer networks, engineering, performing art(Sudartini et al., 2016; Maryanti & Nandiyanto, 2021; Zulaikha, et al., 2021; Rosina, et al., 2021).

Vocational High School is a vocational level educational institution that aims to provide knowledge in the form of abilities or skills in certain fields of work in accordance with the world of work. One of the SMKN 3 Malang has a computer and a major in Network Engineering. Model of basic education in related Information and Communication Technology for the ability to learn programming algorithms, Computer and Network Engineering Students are expected to be able to master material related to computers and networks in order to carry out practice according to the competencies that must be mastered(Sofirudin et al., 2022; Maulana, 2021).

Needs analysis means the process of gathering information about the needs of a particular group in industry or education. That is, in SMK is an activity to obtain information about the needs of students in learning according to their study program. Requirements analysis is very important to be done in course design especially in ESP which is the first step in designing or developing a process(Azizah et al., 2020; Jalinus, 2021).

Monter Carlo Defines a Monte Carlo method as a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results, often used for sampling, estimation, and optimization. This method is named Monaco casino, because the

random outcome model looks very similar for games like craps, roulette, and slot machines(Avlijas, 2018; Huggins, et al., 2022; Zhang, et al., 2021).

In the Bayesian framework, all of the above the problem is solved by formulating a prior distribution, which must collect all available information about the parameters of interest beyond the data, and assuming the input-output model (possibility), that it incorporates our knowledge or lack thereof in the course of which the observed data relates to the unknown parameters(Luengo et al., 2020; Lin & Lin, 2022).

The advantage of numerical simulation lies in the easy and fast access to a large number of output values in FLAC3D. An excellent database is always required rich in data related to actual cases. In this study, many basic input parameters are determined randomly(Li et al., 2021).

2. Research Methods

The research methodology is a way of thinking that starts from identifying a problem, collecting data from articles and guide books as well as observations. The research was conducted based on existing data, to get a conclusion from the problems studied. The research method is a procedure of clear steps and systematically arranged in the research process.

There is a stage section that will provide an overview in the form of a framework, which can be explained starting from the needs analysis process to the results of the research. This research methodology will describe the stages of the research framework that are interrelated with the framework. Research activities are activities in solving a problem which is expected to obtain the desired results and in a long enough time by applying scientific methods based on the procedures and rules that are enforced.

In a study, a methodology that contains a framework is needed. Where in this framework in the form of a description of the steps to be carried out so that the research can run systematically and the objectives that are expected to be achieved as desired. The framework of thought is usually in the form of a theoretical framework and a logical pattern of reasoning framework. The theoretical framework in question is a summary description of the theory used and how to use the theory in answering the research questions.

Framework is a writing plan that draws an outline of an essay to be worked on, as well as a series of several ideas that will be arranged in a systematic, logical, clear, orderly and structured manner. This chapter will describe the research framework, in which this framework is the steps that will be taken in solving problems that are the main subject of discussion. Where this research framework can be seen in Figure below:
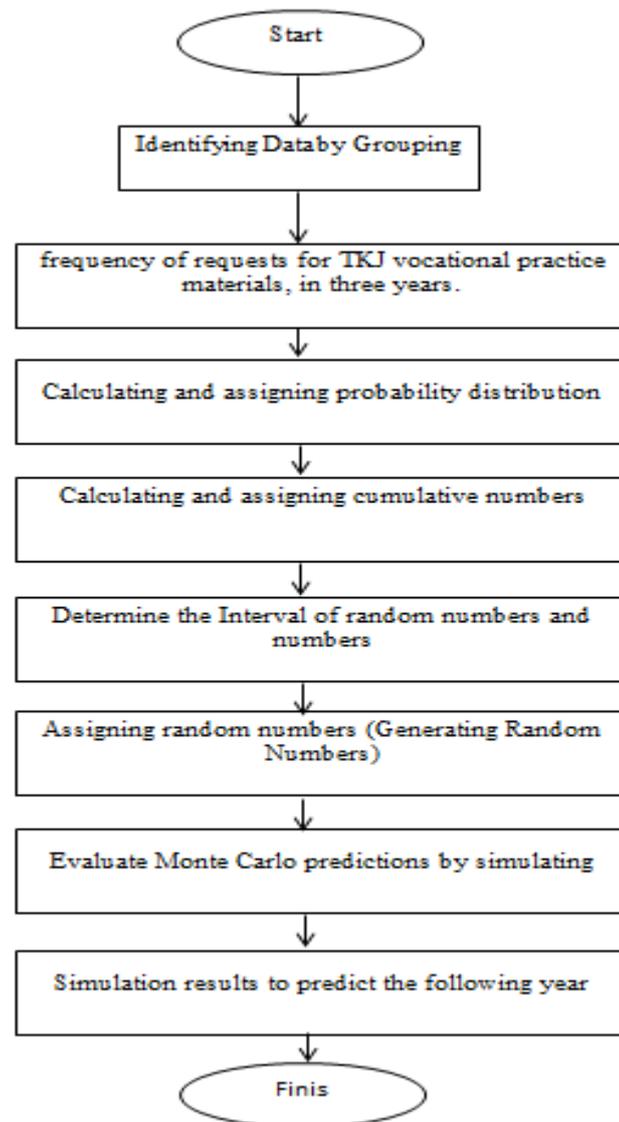
Fig 1. Research Framework

1. Identifying data by grouping
    Identify data by grouping data and assigning
2. frequency of requests for TKJ vocational practice materials, in three years.
3. Calculating and assigning probability distribution
    Calculates and assigns probability distributions. The calculation of this probability distribution was carried out from 2017 to 2018. In the TKJ vocational practice materials
4. Calculating and assigning cumulative numbers
    Calculates and assigns possible cumulative numbers. Calculate the cumulative probability
5. Determine the Interval of random numbers and numbers
    Specifies an Interval of random numbers and numbers for each variable. Used as a determination of the ratio of the specified interval
6. Assigning random numbers (Generating Random Numbers)
    Assigning random numbers (Generating Random Numbers). namely a, c, i, Z0, and mod. with a predetermined formula
7. Evaluate Monte Carlo predictions by simulating
8. Simulation results to predict the following year

The data obtained will then be analyzed in order to produce useful information about how many requests for practice materials by SMK DWI SEJAHTERA PEKANBARU students in data analysis using the Montecarlo method. This method is expected to predict next year.

4. Results and Discussions

After carrying out the analysis and design stages, for the next stage, the implementation of the results that have been analyzed and designed previously will be described. The implementation stages are in the form of hardware implementation specifications and software testing specifications. This is an important role to be able to apply the methods that have been made into the system.

Hardware implementation, which describes the hardware used to implement the system that has been created. The hardware specifications used greatly affect the performance of the system made because this system requires hardware specifications that are able to serve every process used. The hardware used is a laptop to run the system with specifications:

1. Intel Pentium Dual Core Process, 2.5 GHz
2. Memory 2 GB
3. 512 GB hard drive
4. 64 MB VGA card
5. Monitor with a resolution of 1024 x 800 pixels
6. Keyboard and Mouse

To support the implementation of this system requires software specifications such as operating systems and programs that must exist to support system implementation. The software used to design and create and run simulations of practical material requirements is to use.

After all the technical preparations are done, then do the testing using the Monte Carlo method algorithm, to be able to run, first activate the PHP, MySql and internet applications on a personal computer or laptop then open the application.

To facilitate the operation of this system, the interface design is divided into several types, namely:

Login Form

The login form serves to secure the system, the only admin who can operate the system is the admin on duty. To login, the admin must enter the username and password that have been stored in the database.
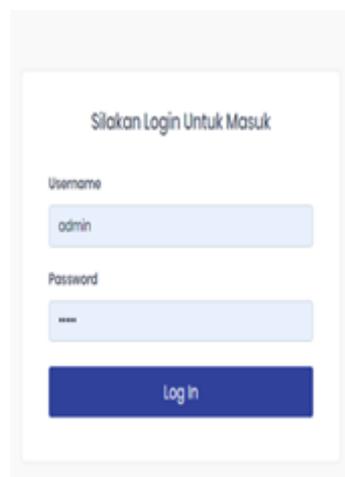
Fig 2. Display Login Form

Main Menu

   Form Home is the first menu that is displayed after the admin inputs the password and username. Figure 3 below will display the home menu or main menu
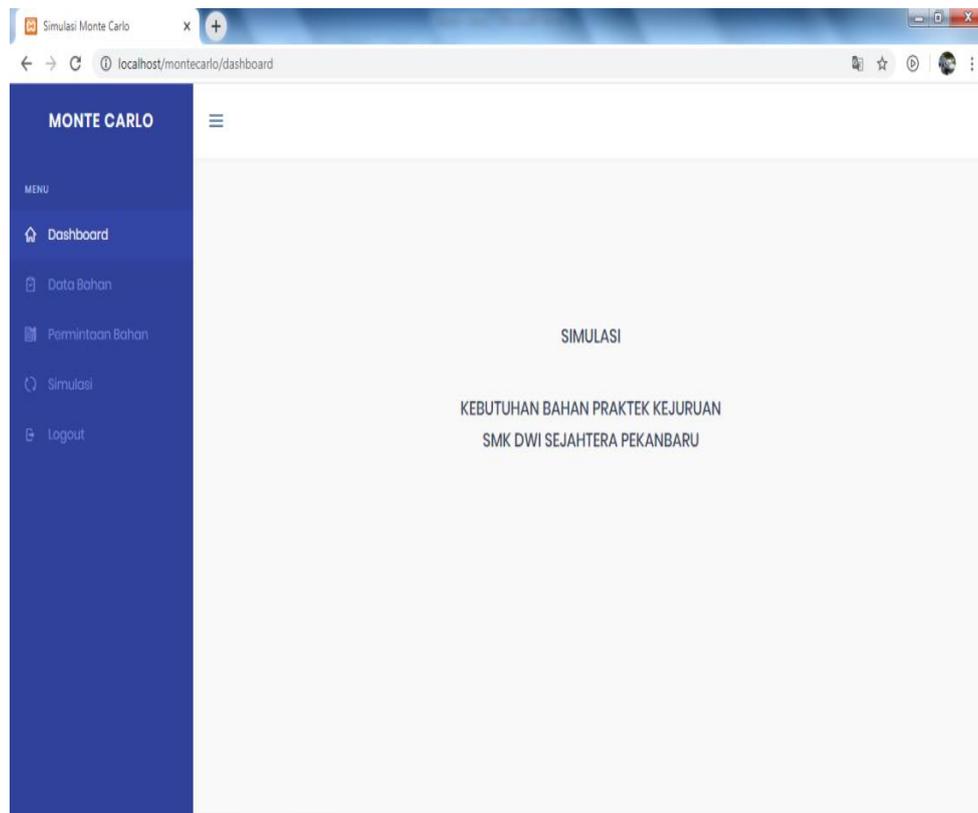
Fig 3. Main Menu

   Main menu is an interface that provides facilities for users where in Figure 3 explains the title of the study and menu options consisting of dashboards, material data, material requests, simulations.

Course form

   The majors form is the first step in the process of the Monte Carlo method. Figure 4 below will explain the name of the department and the data for practice materials in the Pekanbaru SMKDS environment
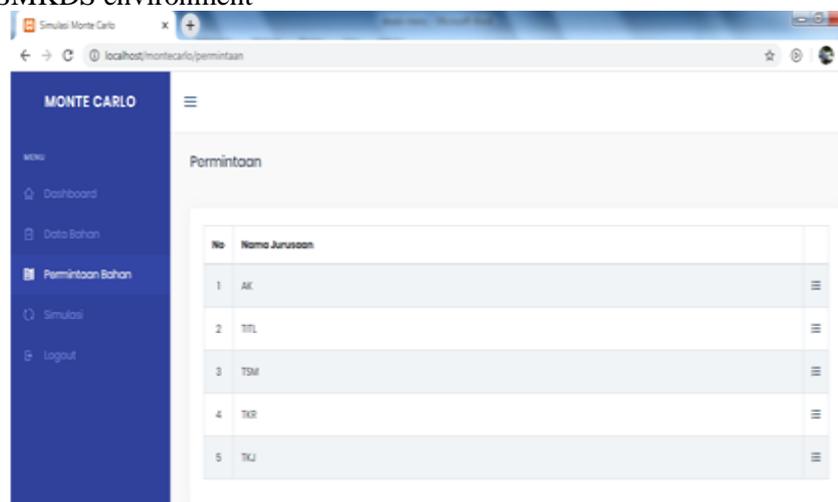
Fig 4. Display Material Request

Figure 4 shows the selection of the practice material menu, which has been inputted first. Admin input the name of the department consisting of: AK, TITL, TSM, TKR and TKJ. then proceed with a file search, which is choosing a file that has been prepared previously to be used as a search file about majors and practice material data according to the chosen major.
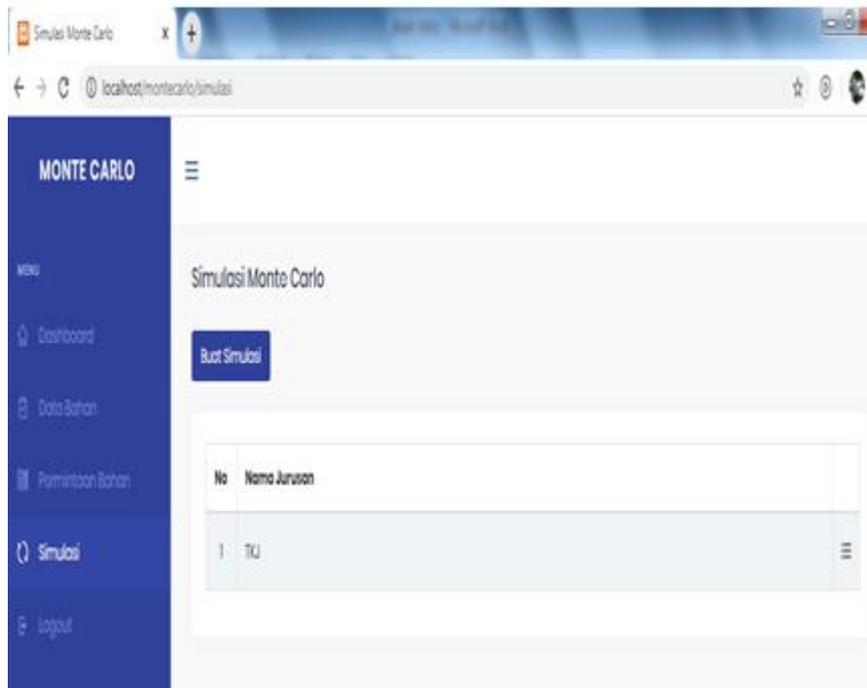
Fig 5. Montecarlo Simulation Form

In Figure 5 is the selection of data. Where the admin accesses the TKJ majors and can display what practice materials are available.

Fig 6. Simulation Process Display

The frequency of inputted practice material requests is then calculated against the number of each request and divided by the number of requests to produce a probability distribution value. and the cumulative number is obtained from the calculation of the initial

cumulative sum of the initial probability values added to the probability value as well as the results for determining the interval as a range to determine the simulation results by generating random numbers that are used as the time range.
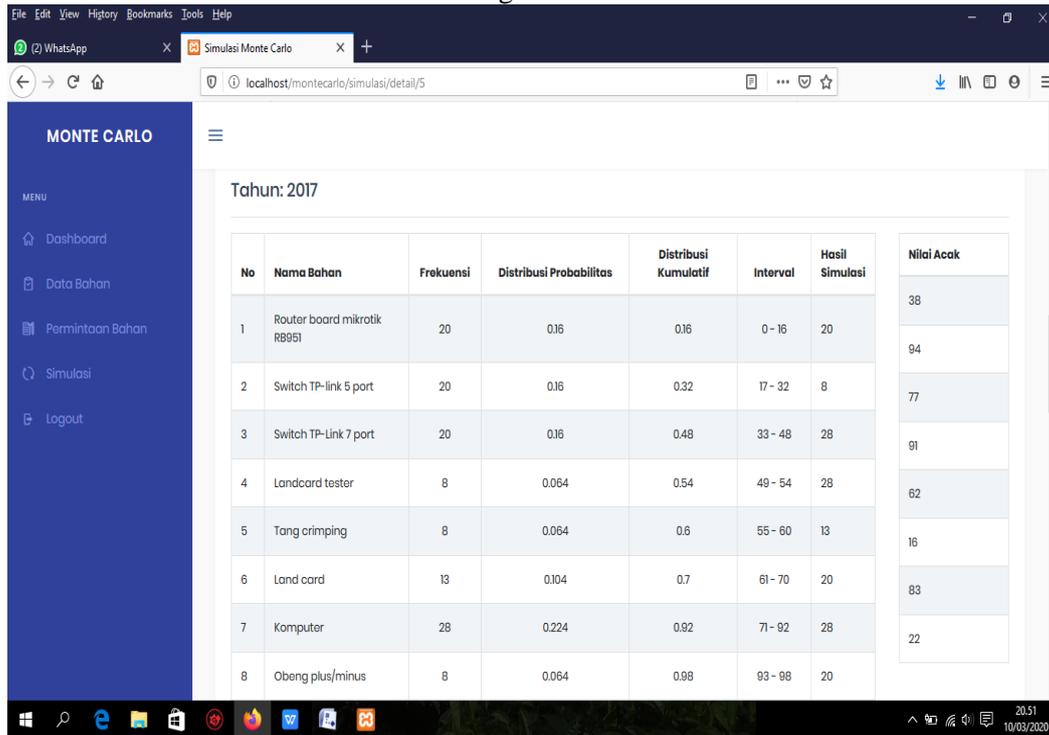
Fig 7. Simulation Results in 2017

Figure 7 shows the 2017 simulation results based on 2017 data. The 2017 simulation results obtained, with the frequency of requests for practice materials. Then they are compared with the existing 2017 real data. The simulation results on the system with manual calculations are the same value.
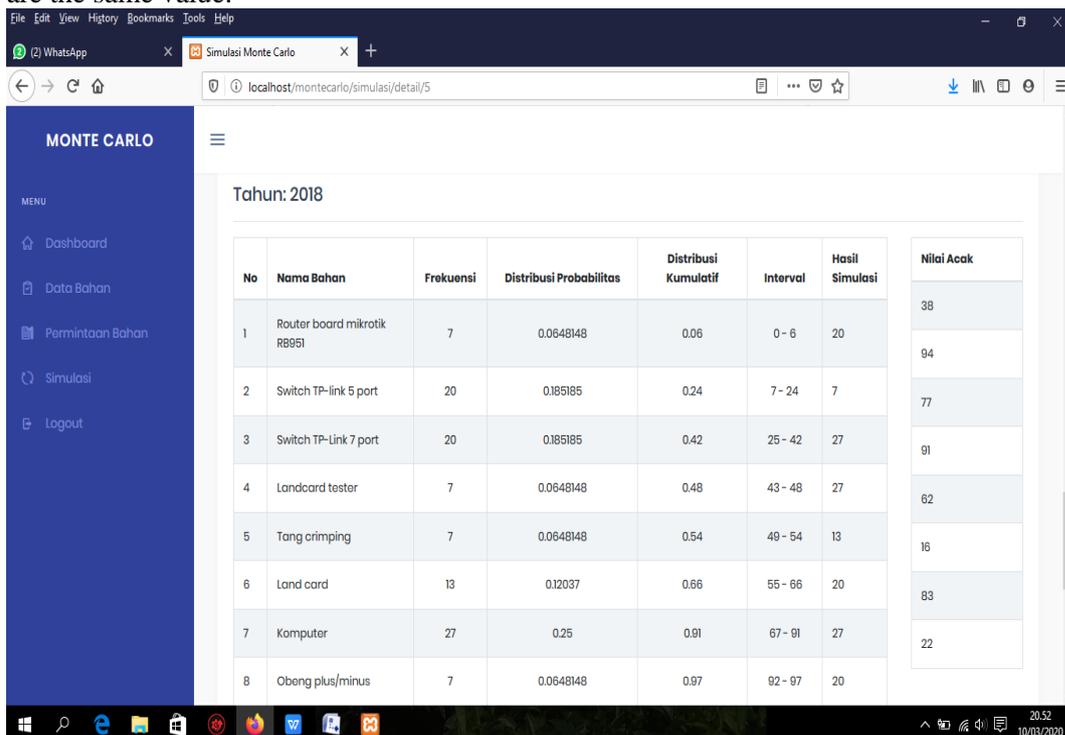
Fig 8. Simulation Results in 2018

Figure 8 shows the 2018 simulation results based on 2018 data. The 2018 simulation results obtained, with the input frequency of practice materials requests are then calculated

against the number of each request compared to the existing 2018 real data. The simulation results on the system with manual calculations are the same. The results obtained from the 2018 simulation are that one of the needs for TKJ practice materials at SMKDS Pekanbaru for TP.2018 increased from real data number 25 to number 27 for TKJ-07 materials, namely computers.

Tahun: 2019

No	Nama Bahan	Frekuensi	Distribusi Probabilitas	Distribusi Kumulatif	Interval	Hasil Simulasi	Nilai Acak
1	Router board mikrotik RB951	20	0.124224	0.12	0 – 12	27	38
							94
2	Switch TP-link 5 port	7	0.0434783	0.16	13 – 16	20	
							77
3	Switch TP-Link 7 port	27	0.167702	0.32	17 – 32	27	
							91
4	Landcard tester	27	0.167702	0.48	33 – 48	20	
							62
5	Tang crimping	13	0.0807453	0.56	49 – 56	20	
							16
6	Land card	20	0.124224	0.68	57 – 68	7	
							83
7	Komputer	27	0.167702	0.84	69 – 84	27	
							22
8	Obeng plus/minus	20	0.124224	0.96	85 – 96	27	

Fig 9. Simulation Results in 2019

Figure 9 shows the 2019 simulation results based on the results of the 2018 simulation calculations. The 2019 simulation results obtained, then the calculation of the number of each request is compared with the existing 2018 real data. The results obtained from the 2018 simulation are that one of the requirements for TKJ practice materials at SMK DS Pekanbaru for TP.2019 is the same from real data with a value of 27 and a value of 27 simulation results for TKJ-07 materials, namely computers.

Fig 10. Simulation Results in 2020

Based on the 2020 simulation results based on the 2019 simulation results. The 2019 simulation results obtained. From the simulation, the result is that in 2020 there will be 20 computers needed. This makes it easier for school leaders to prepare the needs for vocational practice materials, especially TKJ, so that students and carry out PBM well and practice materials can be used more optimally.

5. Conclusion

Conclusions from the research and testing carried out, several conclusions were obtained, including: The application of the Monte Carlo method can analyze the amount of material needed for TKJ vocational practice used in the following school year. With the design of the Monte Carlo method, Waka and Kajur can obtain information on the availability or condition of practice materials at SMKDS Pekanbaru effectively. Where the practice material needs are: TKJ-01=27, TKJ-02=20, TKJ-03=27, TKJ-04=20, TKJ-05=20, TKJ-06=7, TKJ-07=27 and TKJ- 08=27. By using Monte Carlo modeling, the Deputy Head of Facilities and Head of the Department can prioritize the materials that must be prepared optimally. The Monte Carlo method can plan the availability of vocational practice materials for the following year. The design of a simulation system using the PHP programming language can help the Pekanbaru SMKDS for system users to predict the need for vocational practice materials in the next academic year on an ongoing basis.

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