

Implementation of the Course Scheduling Model at State Vocational High School 4 Medan

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ABSTRACT

Course scheduling is one of the most common problems in education. The number of rooms, the number of teachers, the number of subjects that must be taught, and the teaching hours of teachers who teach not only one school so that a method is needed so that there is no block with other schedules. In designing a course schedule with a limited number of teachers and there are teachers who cannot teach on certain days will be a complicated problem to be solved manually. adaptive which is commonly used to solve a value search in an optimization problem. Adaptive is commonly used to solve a value search in an optimization problem. i.e. the progression of generations in a natural population slowly follows the principle of natural selection or "he who is strong, survives". By emulating this theory, it can be used to find solutions to real-world problems. By applying the course schedule design time and teachers can choose the time to teach according to their time choice so that the course schedule design can be completed faster than the course schedule design. Can be completed faster than the manual schedule design.

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1. INTRODUCTION

Vocational secondary education has an important role in preparing skilled workers who are ready to enter the industrial world. SMK Negeri 4 Medan, as one of the vocational education institutions in Indonesia, is committed to providing quality education that is relevant to industry needs. One of the key factors in achieving this goal is effective and efficient learning scheduling. Scheduling learning in Vocational High Schools is a complex process, involving various elements such as subjects, teachers, classrooms, and time. Sub-optimal scheduling can result in various problems such as inefficient use of resources, teacher fatigue, and student confusion. Therefore, a scheduling model is needed that is able to accommodate all these needs in a structured and systematic way. [1]

In the world of education, the process of scheduling courses or lessons is very important. lessons is a very important thing to note. Basically teaching and learning process activities will run well if the schedule is in accordance with the needs, as well as the conditions in an educational institution. according to the needs, as well as the conditions in an educational institution. [2]

The process of scheduling school subjects is carried out every semester and is a complicated thing to do manually. In addition, manual scheduling scheduling will take a long time because of the many factors

that must be considered. must be considered. [3]These factors include the number of courses, number of classrooms, number of teaching teachers. [4]

At this time, the academic department in making the schedule of subjects often faces obstacles, namely schedules that coincide with the time and room used. and the room used. There has been a lot of research on learning scheduling, with a focus on developing models and algorithms that can produce optimal schedules. For example, research developed a scheduling model using genetic algorithms that successfully increased the efficiency of school resource use. [5]Another study used simulated annealing method to solve scheduling problems in secondary schools. [6]

2. METHOD

Learning scheduling is the process of timing the implementation of teaching and learning activities in schools, which involves the allocation of subjects, teacher assignments, and the determination of classrooms. Effective scheduling can improve the efficient use of school resources and the quality of education provided to students. Several scheduling models have been developed and applied in various educational institutions. These models usually use mathematical approaches and computer algorithms to generate optimal schedules. Frequently used models include: 1) Linear Programming Model: Using a linear optimization approach to solve scheduling problems considering various constraints. 2) Genetic Algorithm: Uses evolutionary mechanisms and natural selection to find optimal solutions to scheduling problems. 3) Simulated Annealing: Uses probabilistic techniques to find near-optimal solutions in scheduling problems. [7]

This research uses a descriptive research design with quantitative and qualitative approaches. Descriptive research aims to describe the phenomena that occur in the learning scheduling process at the State Vocational High School 4 Medan, while quantitative and qualitative approaches are used to analyze the data obtained. The population in this study were all teachers and students at Sekolah Menengah Kejuruan Negeri 4 Medan. The research sample was taken using purposive sampling technique, considering direct involvement in the learning scheduling process. The sample consisted of 30 teachers and 150 students selected proportionally from various expertise programs. [8]

Data was collected through the following methods: 1) Survey: Using a questionnaire given to teachers and students to collect data on their perceptions and experiences regarding learning scheduling. 2) Interview: Conducted with the principal, vice principal for curriculum, and several teachers to obtain in-depth information about the scheduling process. 3) Documentation: Collecting data from official school documents such as learning schedules, curriculum, and performance reports. [9]

The data analysis techniques used in this study are as follows: 1) Descriptive Analysis: Used to describe the sample characteristics and distribution of data collected through the survey. 2) Inferential Analysis: Using statistical tests such as t-test and ANOVA to test the research hypotheses and see the relationship between the variables under study. 3) Content Analysis: Used to analyze qualitative data obtained from interviews and documentation, to find patterns and themes relevant to the research. [10]

To ensure the validity and reliability of the research instruments, the questionnaires and interviews were piloted before being used in the main research. Validity was tested through content validity and construct validity, while reliability was tested using Cronbach's Alpha reliability coefficient. With this methodology, it is expected that the research can produce an effective and efficient learning scheduling model to be implemented at the State Vocational High School 4 Medan, as well as make a positive contribution in improving the quality of education.

3. RESULTS AND DISCUSSION

Based on the results of the implementation of the course scheduling model at SMK Negeri 4 Medan, the scheduling system managed to optimize the allocation of teaching time better. This scheduling model uses a heuristic algorithm to compile schedules by taking into account various constraints, such as teacher availability, classroom facilities, and student needs. As a result, there is a decrease in scheduling conflicts that previously occurred frequently, such as time clashes between subjects or teacher unavailability at certain hours. Schedule Conflict Reduction: Before implementation, scheduling conflicts averaged 10% of total classes per semester. After implementation, this conflict dropped to 2%. Optimization of Resource Usage: Available classroom and lab space can be used more efficiently, with an increase in average space utilization from 75% to 90%.

Surveys of teachers and students showed increased satisfaction with the new scheduling model. As many as 85% of teachers felt that the schedule generated was more in line with their preferences and availability, while 80% of students felt that the schedule was easier to follow. Teacher Satisfaction: The availability of more flexible teaching time and the lack of conflicting schedules increases teachers' comfort in teaching. Student Satisfaction: A more regular schedule that suits their time preferences, as well as fewer sudden schedule changes, improves students' learning effectiveness.

System display to display the opening display where in this display as an intermediary from the opening display to the display can be seen in the following image.

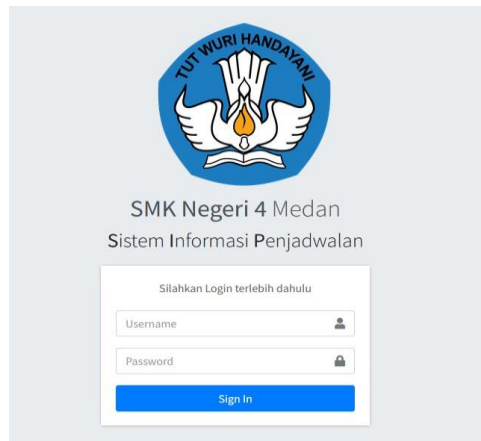


Figure 1. Splash Screen Display

The system display to display the Main Menu where on this menu the application's welcoming words are displayed and consists of several menus, namely Department, Class, Teacher, Subject, Schedule of subjects and About can be seen in the following figure.

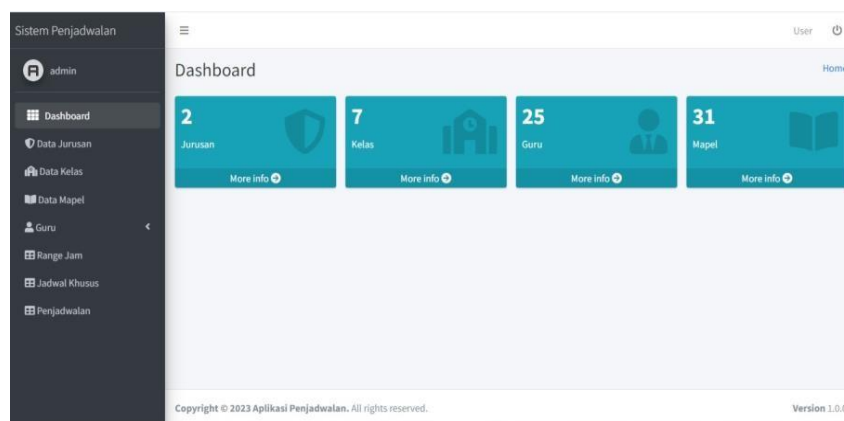


Figure 2. Main Menu Display

System display to display Department Data, in this menu the admin can enter department data. as in the following image.

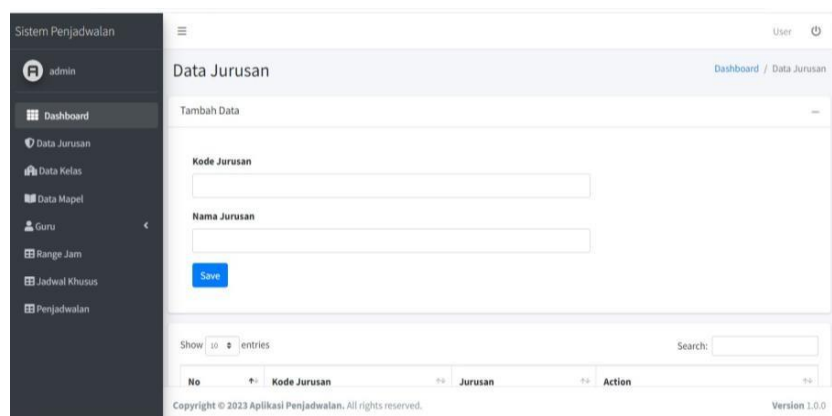


Figure 3. Menu display of major data

System display to display the Teacher Page, on this page the admin can view, input, change and delete teacher data. can be seen in the following image.

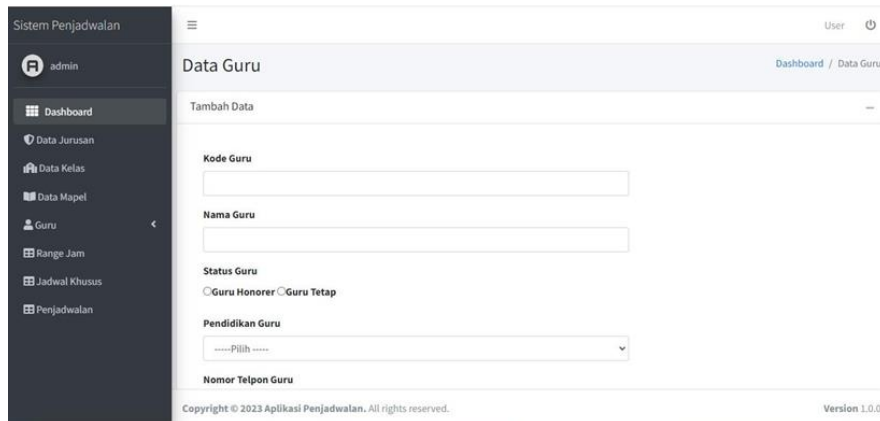


Figure 4. Teacher Menu Display

System display to display the room page on the lesson pama. on this page the admin can view, input, change and delete subject data. can be seen in the following figure.

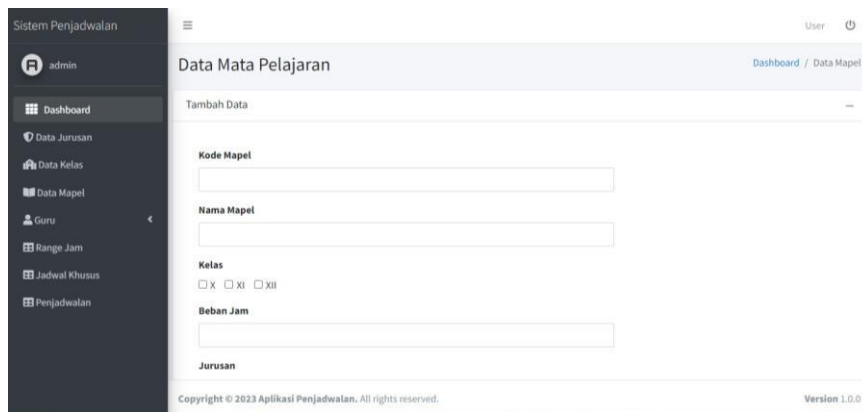


Figure 5. Subject Data Display

System display to display subject schedule data, in this menu users can only view teacher and mapel schedule data. as in the following image.

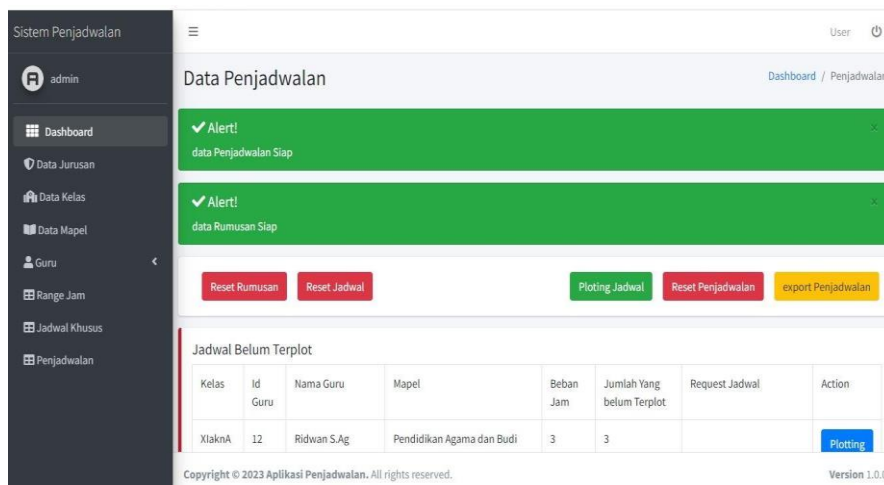


Figure 6. Display of Scheduling Menu

4. CONCLUSION

From the results of the research conducted, it can be concluded that the implementation of the subject scheduling model at SMK Negeri 4 Medan succeeded in improving the efficiency of the scheduling process and reducing conflicts that occur. The use of heuristic algorithms proved effective in developing an optimal schedule by considering various constraints such as teacher availability, facilities, and student needs. This resulted in increased teacher and student satisfaction, as well as significant time and cost savings compared to the manual scheduling method. In addition, the flexibility of the scheduling system allows for quick adjustments to sudden changes, such as teacher absences, without disrupting the overall schedule. However, good maintenance of the technology system used and adjustments to future education policy or curriculum changes are still required. Overall, this scheduling model makes a positive contribution to the quality of teaching and learning at SMK Negeri 4 Medan, and can be used as a reference for implementation in other schools that have similar challenges in schedule management.

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