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Implementation of a Monitoring Information System for Student Field Work Practices to Support Green Computing : Case Study of the Kertasemaya Teladan Vocational School

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ABSTRAK

Meningkatnya proses komputasi secara langsung berdampak pada tingginya tingkat emisi karbon dioksida (CO2). Untuk meminimalisir situasi tersebut, terdapat kampanye komputasi hijau yang berfokus pada penggunaan komputasi hemat energi dan ramah lingkungan. Langkah awal penerapan green computing perlu dimulai dari sektor pendidikan, dalam hal ini SMK, sebagai lembaga strategis yang tidak hanya sekedar teori namun juga praktek penerapan green computing. SMK Teladan Kertasemaya sebagai sekolah yang memiliki komitmen ramah lingkungan ingin menerapkan konsep tersebut dalam kegiatan praktik kerja lapangan dimana dua fokus utamanya adalah pengurangan kertas dengan menerapkan sistem informasi monitoring praktik kerja lapangan dimana proses absensi, pembuatan jurnal harian, laporan, keluhan, dan penilaian dapat menggunakan perangkat web dan mobile agar lebih efisien, proses pengembangan dilakukan dengan metode RAD yang dapat menghemat waktu dan menjamin kualitas sistem yang dikembangkan, serta penggunaan teknologi virtualisasi untuk server menggunakan VPS yang lebih hemat energi dan biaya, yang merupakan tujuan komputasi ramah lingkungan.

***Kata kunci**: green computing, sistem informasi, Monitoring PKL, SMK Teladan Kertasemaya*

ABSTRACT

Increasing computing processes directly affects high levels of carbon dioxide (CO2) emissions. To minimize this situation, there is a green computing campaign that focuses on the use of energy-saving and environmentally friendly computing. The first step in implementing green computing needs to start in the education sector, in this case vocational schools, as strategic institutions to not just theory but practice green computing. Kertasemaya Teladan Vocational School, as a school that has a commitment to being environmentally friendly, wants to implement this concept in field work practice activities where the two main focuses are reducing paper by implementing a field work practice monitoring information system where the attendance process, making daily journals, reports, complaints, and assessments can be used. web and mobile devices so that they are more efficient, the development process is carried out using the RAD method, which can save time and guarantee the quality of the system being developed, as well as the use of virtualization technology for servers using VPS, which is more energy and cost-efficient, which is the goal of green computing.

***Keywords**: green computing, information systems, fieldwork practices, monitoring, Kertasemaya Teladan Vocational School*

1. INTRODUCTION

The increasing use of computing devices in all aspects, activities, and various forms of applications requires quite large energy needs [1]. The high need for computers is in line with the large power consumption and also increases the release of carbon dioxide (CO2) emissions. One thing that can be done to reduce carbon emissions is through the concept of green computing. This paradigm includes cost-effective and environmentally friendly energy for a cleaner planet by aligning organizational goals [2]. There are many organizations that are starting to implement green ICT. Either as a whole or little by little as an effort to reduce carbon levels [3].

The education sector, in this case, the school, is the organization that needs to be the first to implement the green computing concept. Where not only environmentally friendly computing and the principles of its application are introduced, but also starting to practice the principles of green computing itself [4]. Vocational high schools are institutions that have great potential for implementing this principle. One of the activities that can implement the green computing principle is practical fieldwork carried out by students in various agencies and industries.

Field work practice is a form of implementation of educational programs in schools, with mastery of competencies and skills obtained through experience of direct work activities in agencies [5]. While students carry out field work practice at the agency, there are several processes such as attendance, keeping a journal of daily activities during the student's field work practice, and writing reports. Therefore, students are usually provided with agenda books that are printed on paper so that they contribute to global warming, which is contrary to the environmentally friendly concept.

The Kertasemaya Teladan Vocational School aims to align student skills with industry needs and also requires students to carry out practical field work. The spread of practical fieldwork locations for students at Teladan Kertasemaya Vocational School is an obstacle for schools, especially the industrial relations section, in dividing teachers to guide and allocate time for students to visit institutions and see the students' conditions and progress during practical fieldwork. This can be seen from the limited time allocated for visits, only at drop-off time, at the beginning of the month, and at the end when students are picked up from the agency. This limitation also makes it difficult for supervising teachers to see students' problems while they are at the agency, both problems originating from students such as not coming to work, moving places, or problems from the agency, where one of the causes is a lack of communication between supervising teachers, students, and supervisors. agencies, so that the original goal of field work practice, which was to increase students' competence and readiness to enter the world of work, was not achieved.

As a vocational school that wants to implement an environmentally friendly school, the Kertasemaya Teladan vocational school is committed to gradually reducing the use of paper in students' practical field work activities, thus requiring the role of information and communication technology in the process to monitor students in the institution. With this information system, students can take attendance online using their mobile devices, so that supervisors can know the student's location when taking attendance. Apart from that, supervising teachers can see what students do during practical fieldwork because students write daily journals in this information system, which is validated by agency or industry supervisors. Through this information system, supervisors at institutions can also make complaints regarding student problems, so that supervisors can immediately find out and management, especially in the field of industrial relations, can see student progress. So it is hoped that the process of forming student competencies to be ready to compete in industry through fieldwork practice can be well formed

because, during the process, they are supervised and guided directly through this information system. Not only that, the application of this information system also pays attention to the technology and processes used so that the main goal of supporting the concept of green computing can be realized.

2. METHODOLOGY

Rapid application development is a system development method that saves time, is quite flexible, and adapts to user needs. By saving time, the RAD method can minimize costs by guaranteeing the quality of the system being developed [6]. The choice of the RAD method is again aimed at supporting green computing, namely green use, where, with little time and a flexible process, it can minimize the use of paper [7] for documents in design and reduce excessive face-to-face contact due to the large distance between the development team and the Kertasemaya Teladan vocational school location.

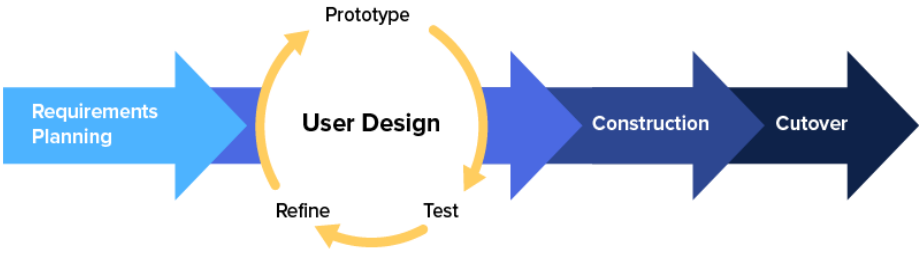

Figure 1. Rapid application development method

A. Requirements planning
   Determining the needs to be met by a project, where the goal is to get clear needs and think about strategies to solve them.
B. User design
   Quickly create a prototype along with its features and functions to find out whether it suits the client's needs, so that developers have the capital to create quality applications.
C. Construction
   Turning prototypes into beta to final applications, coding to testing, until all aspects of the product are created .
D. Cutovers
   Optimization for application stability and maintenance This stage is the last step before the system is handed over to the client.

3. RESULTS AND DISCUSSION

Before developing and implementing this information system, the team conducted a survey and signed a statement regarding the willingness of the Kertasemaya Teladan Vocational School to become a partner. During the development process, the team and partners will be involved in several discussions to find out the needs and development of the information system that will be created.

3.1 Requirements Planning

The first step taken at the requirement's planning stage was that the team conducted a discussion regarding the problems and obstacles that the Kertasemaya Teladan Vocational School had regarding field work practices that had occurred so far. Then carry out an analysis and look for solutions together.

From these results, the team obtained a pattern for implementing fieldwork practices and divided the users of the system that would be applied. There are four main users who will use this information system, including.

Table 1. User Identification

User	Information
Student	Students who carry out practical fieldwork
Tutor	Teachers are assigned to guide students
Field Supervisor	Agency employees assigned to guide students during practical fieldwork
Admin	Information system manager

After the users who will use the system are identified, the next step is to model the business processes related to the system that will be implemented to meet the needs of the Kertasemaya Teladan Vocational School. This modeling was carried out to facilitate partners' understanding of the system flow and to retrieve information that is appropriate to the conditions at the Kertasemaya Teladan Vocational School.

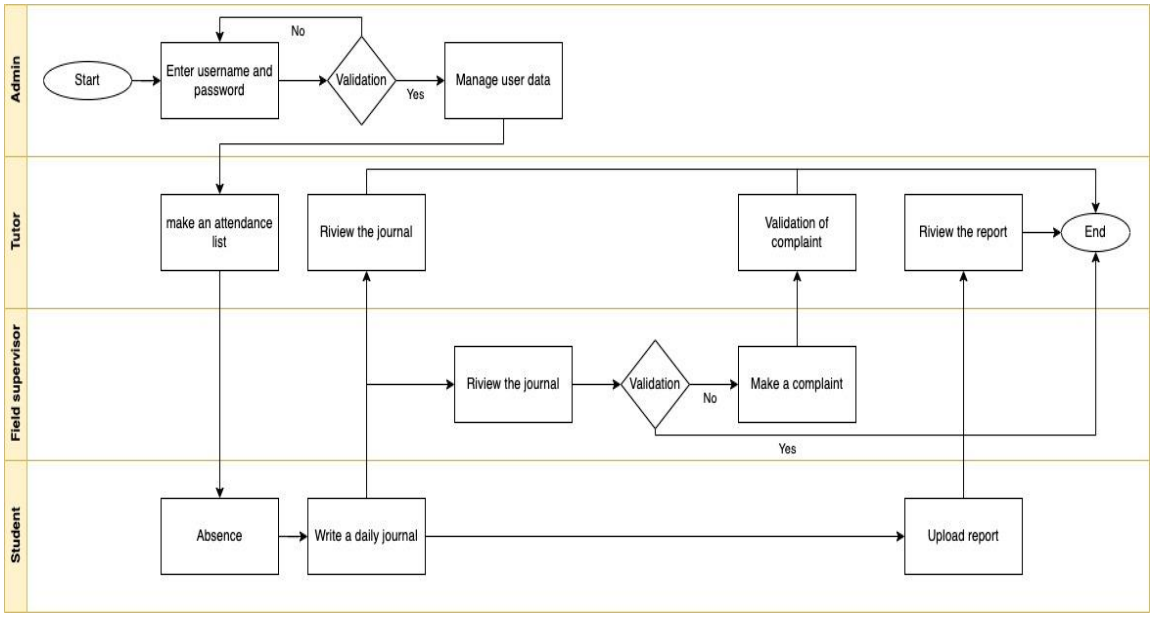

Figure 2. Business process modeling

3.2 User Design

At this stage, an evaluation of the business processes that have been modeled and discussed previously with partners is carried out and then derived by making detailed user needs related to information needs and functional and non-functional needs of the system to be built. After analyzing the business process scenarios created, there are several inputs and evaluations. To make it easier to develop the system, the results of the analysis are described as a system use case.

Table 2. Use case Identification

User	Information
Student	Make an absence, manage reports, managing journals
Tutor	Make an absence, manage reports, managing journals, complaint
Field Supervisor	Managing journal, complaint
Admin	Managing departments, manage the class, manage the agency, managing students

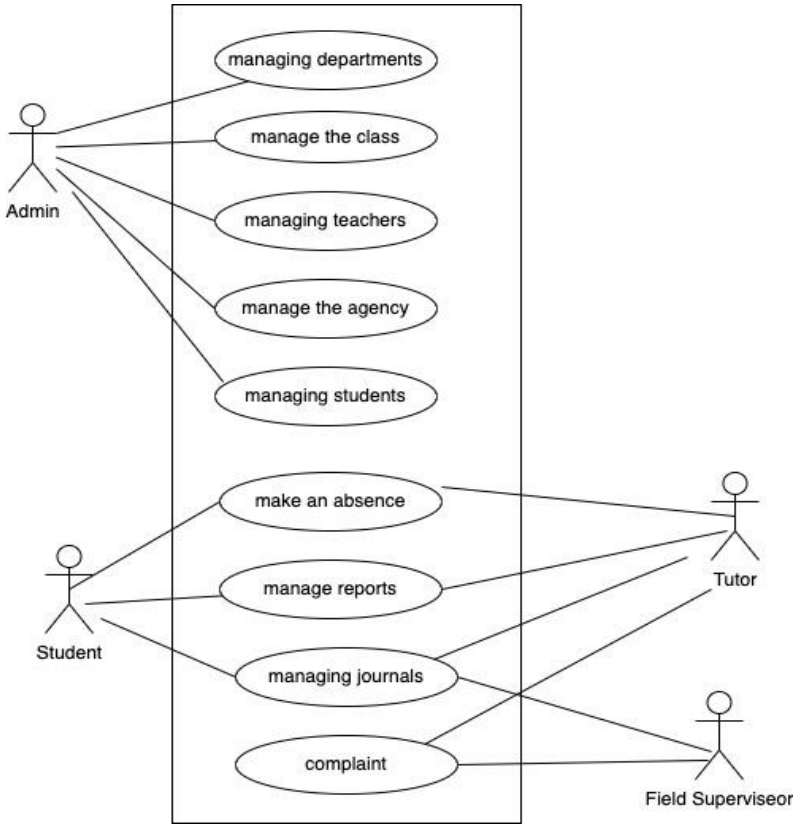

Figure 3. Use case information system

Based on the results of the analysis carried out, the equipment needs that will be used by users of this field work practice monitoring information system are also identified. There are two devices that will be used by users of this information system, namely web and mobile. For mobile itself, the need is for GPS location when students come and go home on attendance. so that the location of the student can be known when taking attendance.

To find out more about the requirements regarding the device and its specifications, you can see the following table

Table 3. System user requirements

User	Device Requirements	Specification
Student	Smartphone	Android, RAM minimum 2 GB
Tutor, Field Supervisor, Admin	PC / Laptops	- Operating system Min Windows 10, Linux, or mac - Web browser

After creating a use case and knowing the process of the system that will be implemented, the next stage is to create a system prototype. This prototype aims to make it easier for partners to understand whether the system meets their needs by providing an overview of the information system being developed before it is implemented.

A prototyping is created before the system is actually implemented to collect information from users who can interact with the prototype being developed, because the prototype describes the system work process for a larger actual system. [8]

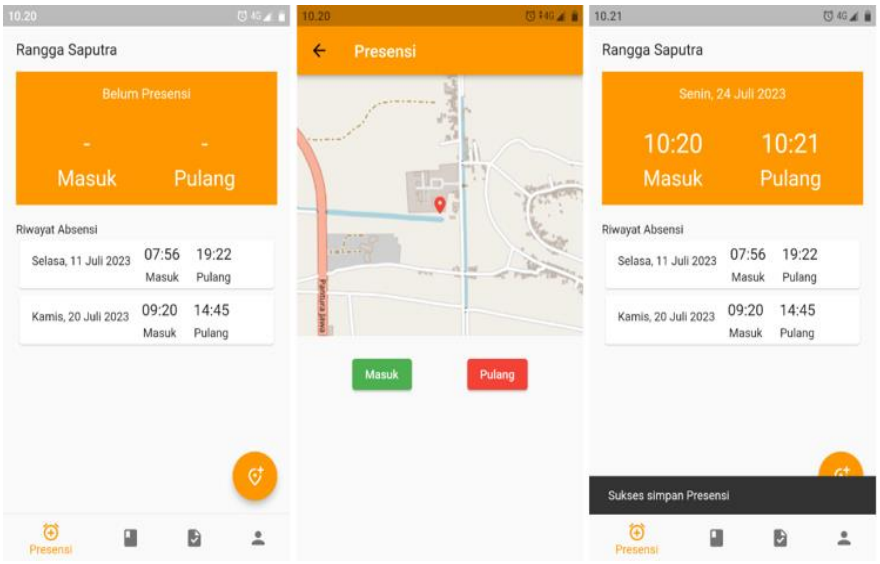

Figure 4. Student attendance process

Figure 4 explains how students take attendance via mobile devices. Attendance is taken according to the student's location. This is intended so that students actually take attendance according to the location of the fieldwork practice.

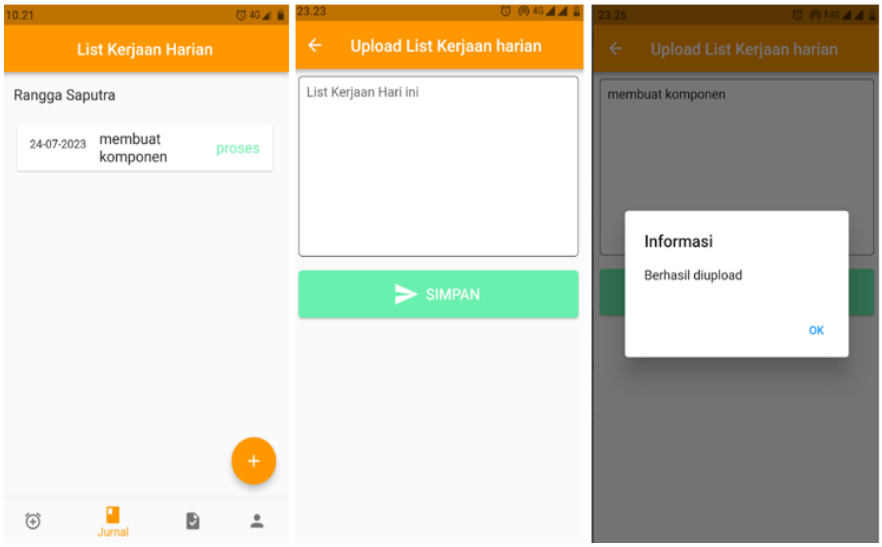

Figure 5. Journal input process by students

This design is intended for students to include a list of activities that they carry out during fieldwork practice at the agency. The data entered will be validated by the agency supervisor before being accepted by the supervising teacher.

After students have finished carrying out fieldwork practice at the agency, they are required to make a fieldwork practice report. The aim of this function is to make it easier for students to provide their reports to the teacher during the fieldwork practice period. So that after completion, students can immediately present their fieldwork practices based on the reports that have been made and revised previously.

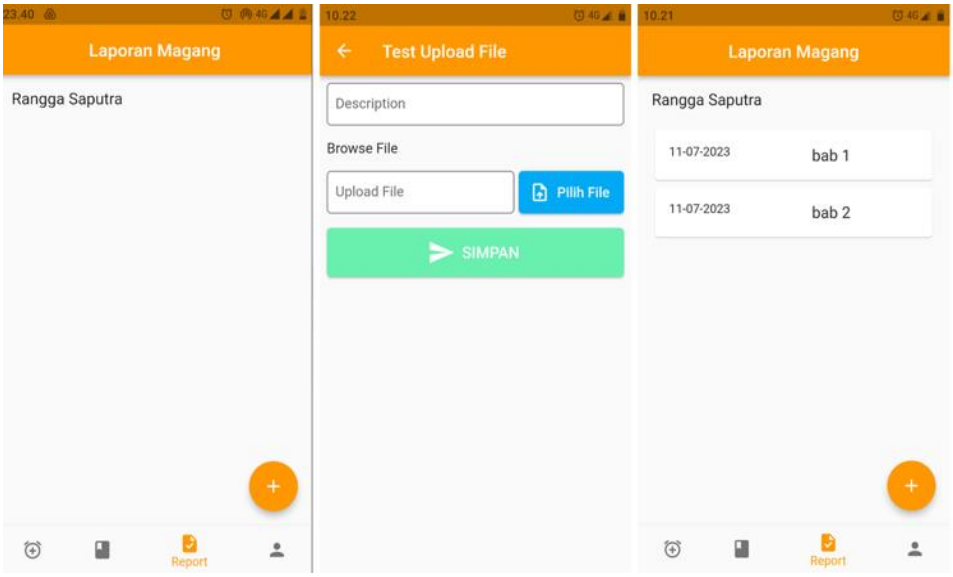

Figure 6. Student report input process

For admin users, tutors and industrial advisors, the system uses a website-based interface. where the consideration is that users do not have to install many applications on their mobile devices, especially industry advisors who are parties outside the school.

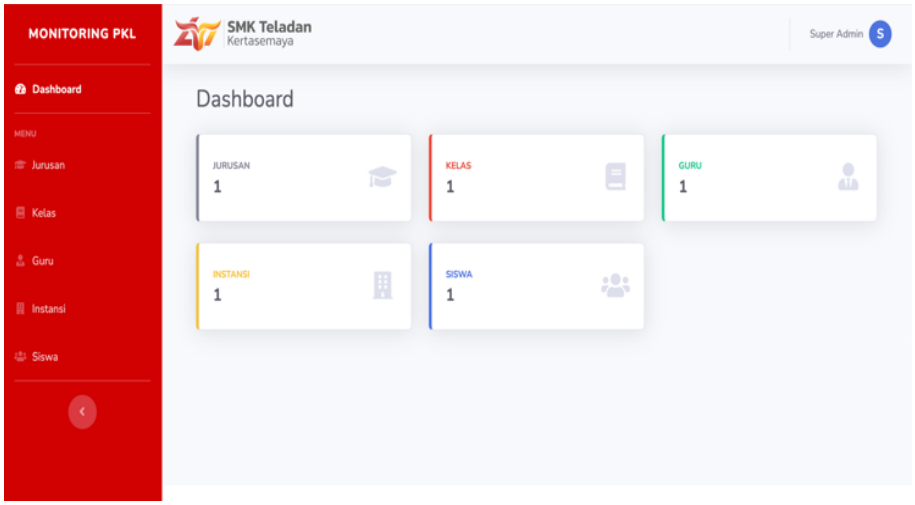

Figure 7. Admin dashboard homepage

For admin users, the admin dashboard consists of several menus that can be accessed, where other users must be registered first by the admin on this page.

Table 4. System user requirements

Menu	Information
Major	Manage the majors at the Kertasemaya Teladan Vocational School.
Teacher	Manage teachers who will become mentors.
Absence	Manage the agency where students carry out practical field work.
Student	Manage students

During the function analysis process for admin, the team brainstormed with the assistant vice principal for industrial relations.

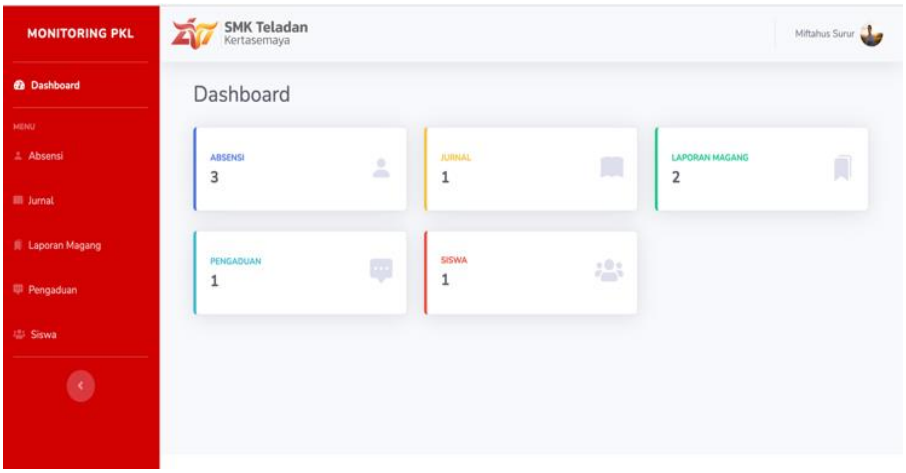

Figure 8. Tutor dashboard

For teachers who have been registered by admin, you can carry out several processes provided in the dashboard.

Table 5. Tutor dashboard menu

Menu	Information
Absence	View student attendance.
Journal	Validating student journals
Report	View student reports.
Complaint	Validate complaints from agency supervisors.
Student	Seeing guidance students.

Apart from that, agency supervisors can also access the system, where the username and password have been entered by the admin previously.

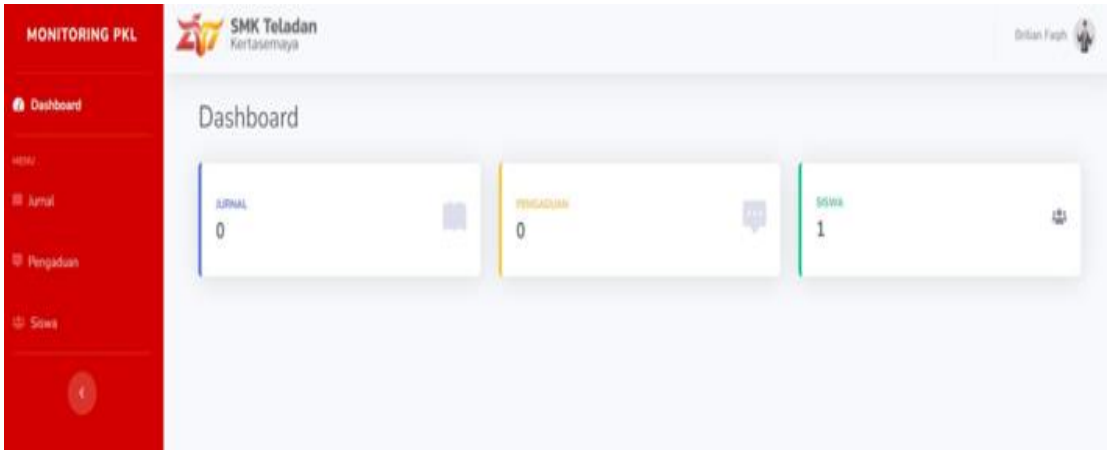

Figure 9. Agency guidance dashboard

For agency supervisors, there are several menus on the dashboard. Agency supervisors are people assigned by industry to guide students from industry.

Table 6. Agency guidance dashboard menu

Menu	Information
Journal	Validating student journals
Complaint	Make a complaint
Student	Seeing guidance students.

3.3 Construction

After the previous process, provide system usage scenarios to the stakeholders involved. The team received several inputs and scenarios, so these inputs were analyzed again and entered into new functions in this information system. The following are some analysis results based on input from users.

Table 7. User evaluation

User	Additional Functions	Information
Field supervisor	Provide an assessment	To provide an assessment from the agency towards students
Tutor	View details of attendance location	To see a map of the student's location during attendance

From this evaluation, the following is the value function added to the agency's supervisory users.

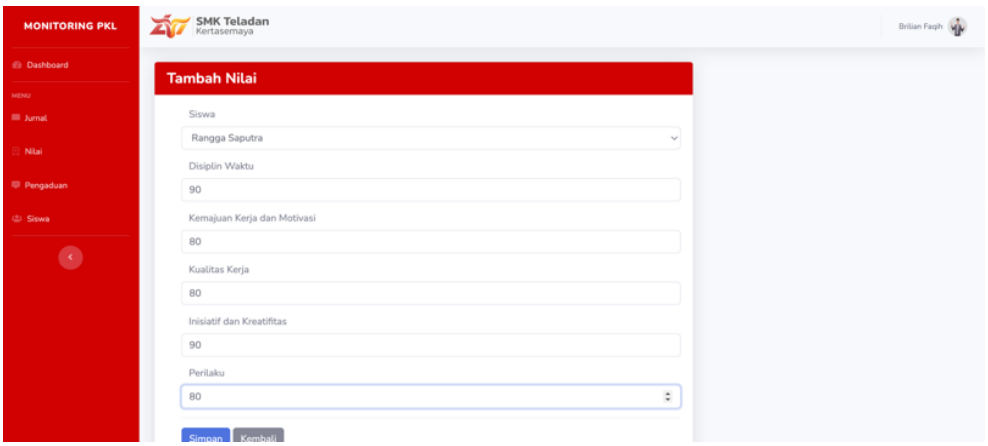

Figure 10. Assessment function

For the assessment criteria, there are five components based on time discipline, work progress and motivation, work quality, initiative and creativity, and behavior. This component is a request from the Kertasemaya Teladan Vocational School, where if it is based on competency standards, it will be different for each agency. So, to make the assessment uniform, components, as mentioned, have been created.

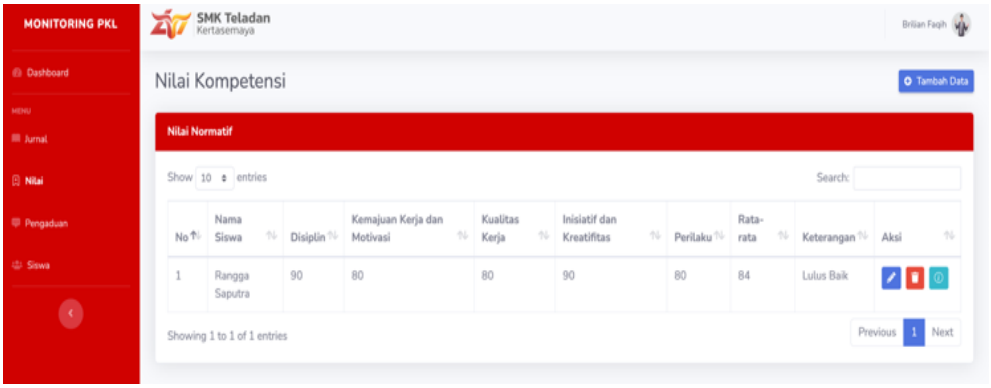

Figure 11. Student assessment function

The next additional function is to view detailed maps of student attendance locations. This data is obtained when students take attendance using their mobile devices.

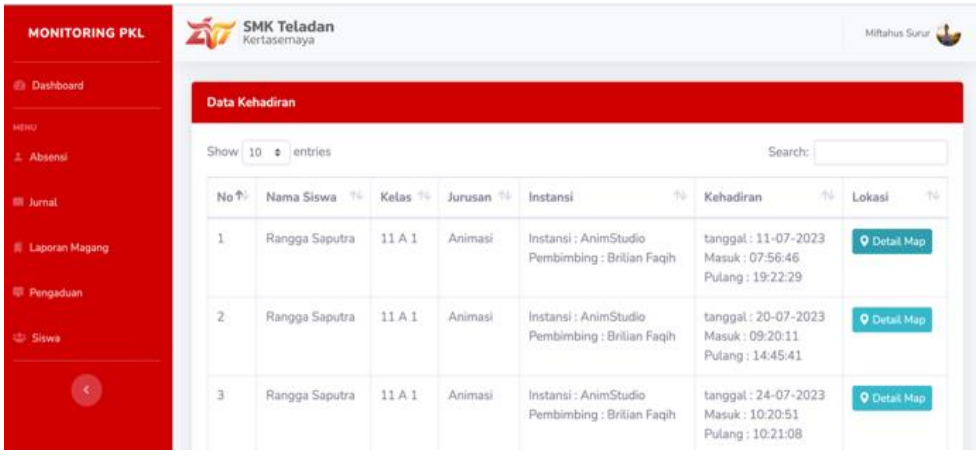

Figure 12. Attendance data page

To see maps of student attendance, supervising teachers can click the detailed maps button. Detailed maps of student attendance can be seen based on the student's location when taking attendance on their mobile device.

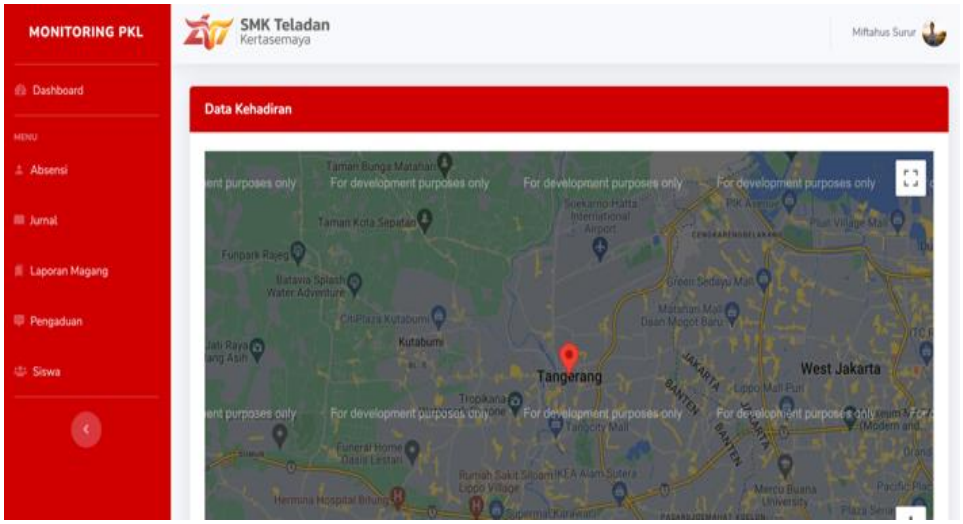

Figure 13. Detailed map

3.4 Cutover

At this stage, an analysis is carried out to use technology that can support green computing, where one solution is the application of virtualization technology as the most appropriate way to reduce carbon dioxide gas [9]. Virtualization itself saves more resources and, as a result, has lower energy consumption [10]. And VPS is a solution for using a server, which will serve as the basis for all processes in this information system. The VPS used to run this system is idcloudhost, with the following specifications.

Table 8. VPS spesification

Device	Specification
CPU	4 vCPUs
Memory	4 GB
Disk	60 GB
Operating System	Ubuntu 22.04lts

4. CONCLUSION

This activity is intended to assist the Kertasemaya Teladan Vocational School in monitoring students while carrying out practical fieldwork activities at the agency. With two main objectives, namely minimizing the use of paper for implementation documents as well as making the monitoring process faster because all forms of field work practice processes are directly processed in this information system, Apart from that, as a step to support green computing, the process of implementing this information system uses the rapid application development method, which allows for short and cost-effective development while still prioritizing system quality. And the use of VPS virtualization technology for servers allows

SMK Teladan Kertasemaya to save more on resource usage and lower energy to realize green computing.

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