Teacher Attendance Monitoring System Teaching with QR-Code and Geo Location using Android Platform

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Abstract. The world of education has a good level of reputation if it has a professional educator staff and with high integrity, one of the examples is that educators must be hardened on time and not truant to teach students at school. So that the stigma of students and the community does not give a negative value. The role of the principal is also very important to build high integrity, a principal must always monitor every day the teachers who enter the class. But the limitations and the many teaching hours of teachers that must be monitored make the principal difficult because of limited time and other busyness. So the need to design and build an Android platform-based application that is intended to monitor the schedule, and the presence of teachers in real-time called Teacher Attendance Monitoring System Teaching with QR-Code and Geo-Location. SoftwareThe software is intended to make it easier for principals to monitor teachers who teach in class in real-time. Black box testing results show 100\% for functional testing of systems and for testing the application interface has a 100\% success rate. Then the software is feasible to use.

1. Introduction

Teachers have a very important role in the world of education, Wijaya and Rusyan (in Suprastowo P: 2013) mention the teacher is a very dominant and most important actor informal education in general because, for students, teachers are often used as role models and even become self-identification figures, by because it requires good supervision from the school. according to Renata (in Kristiawan: 2019) argues there was a significant influence of headmasters’ supervision toward effective teachers. The headmaster should upgrade the supervision of teachers where they would actualize the effective teachers. According to Sutisna (1989) supervision is an administrative function in which the administrator ensures that what is done by what is desired. Supervision will
include inspection activities, whether all goes according to the plan made, instructions issued, and principles that have been set (Aedi, 2014).

One supervision that needs to be done by the school is the presence of teachers. The school is monitoring the presence of the teacher should not only when the teacher enters school, but there is more important that needs to be monitored also the presence of the teacher when he enters teaching and being present in class. A problem faced by several schools, the lack of supervision and control by the party or school staff towards the teacher’s attendance at the time of teaching due to the vastness of the school, the number of classes and the many hours of teaching that need to be visited by officers in conducting a teaching absence system.

Based on these problems, with the development of technology there needs to be a solution that is by making a digital-based presence application that can identify teacher attendance quickly and in real-time and with high integrity, related to presence attendance has done a lot of research on attendance applications. Among them [1] has conducted a study entitled “QR Code Based Smart Attendance”, the study conducted smartphone-based attendance by scanning the existing QR Code on students to teachers to confirm their presence.[2] has conducted a study entitled ”QR Code, Face Recognition, and Google Location as Alternative Solutions for Attendances in Private Coloring Studio”, the study of employee attendance using Android applications by utilizing QR-Code technology, Face Recognition, and Google Map Location. (Rizal M et al., 2017) conducted a study entitled ”Smart Attendance System Applying QR Code”, the study of automatic student attendance systems using QR-Code used in vocational schools. (Kumbar A et al, 2014) conducted a study entitled ”Automated Attendance Monitoring System using the Android Platform”, the research was about developing an Attendance Monitoring System (AMS) using the android platform with the System Development Life Cycle research approach using the spiral model method [3].

Related to the literature studies that have been carried out related to teacher presence research, the research only uses one platform in its application. in this research the researcher will develop a mobile-based presence system that is integrated with the website using a spiral software development method and with different studies, with the title ”Teacher Attendance Monitoring System Teaching with QR-Code and Geo Location using Android Platform” in one of the major vocational schools can help the school, especially the attendance officer teaches in terms of controlling the presence of teachers at the time of teaching so that the officer does not need to go around the school for control and also the school especially the principal can supervise any teacher who has entered teaching in realtime.

2. Methodology

The methodology used in the process of developing this research system using the System Development Life Cycle (SDLC) [11] with a spiral model approach. SDLC is a series of
activities carried out by professionals and users of information systems to develop and implement software (programs), the stages of the process of developing a structured and determined software at each stage, from the analysis stage to the maintenance and renewal process of the software.[12]

Figure 1 is a cycle in the System Development Life Cycle method, starting from Requirement analysis, design, Implementation, Testing, Evaluation. The five processes will be explained as follows: [13][14]

1) Requirement analysis
   This stage is the process of collecting data empires and non-empires, qualitative, quantitative, or descriptive to be analyzed and identify everything needed to be taken to the next stage.

2) Design
   The design stage is the process of designing software from the results of the analysis. The design can be in the form of data design, normalization, relations, determine the attribute table, class, system design, and interface display.

3) Implementation
   After the design process is complete. Then the next stage is the implementation of the design that has been done. The implementation process can be adjusted to actual needs, or according to market needs. Both in terms of programming languages, or types of platforms, in this research the design that has been done is implemented into the Android platform. What is the programming language,
the implementation process must be consistent and consistent with the design previously made.

4) Testing
The testing phase is carried out when the implementation process is complete. The testing process is useful for knowing errors that occur in software before being released to the user. The testing process can be done by testing the white box, blackbox, and beta test.

5) Evaluation
The evaluation phase is carried out to update the software system from deficiencies or bugs based on the testing phase carried out and will return to the first stage, namely requirements analysis.

The five phases will continue to be made considering the software is never obsolete and will continue to grow following the demands of users who are varied and dynamic.[15]

2.1. Spiral
Spiral is a model that is included in the System Development Life Cycle methodology, said to be spiral because the framework in the software development cycle follows a spiral pattern. [16] Although the spiral model is said to be a complex model [17], the selection of the spiral model is adapted to the conditions of research and user needs, ie a process that is short in time and does not require high costs[18].

![Spiral software development model](image_url)

Figure 2. Spiral software development model Source:[3]
Figure 2 is a spiral model cycle. Typical phase in this model will be explained as follows:

A typical cycle of the spiral. Each cycle of the spiral begins with the identification of the objectives of the portion of the product being elaborated (performance, functionality, ability to accommodate change, etc.); the alternative means of implementing this portion of the product (design A, design B, reuse, buy, etc.); and the constraints imposed on the application of the alternatives (cost, schedule, interface, etc.). Because the software development process is in a short time. So in the process of building software using a spiral, the process in each cycle must involve the user in the design process so that the process of making the software is properly handled. [19]

The spiral model has 4 cycles that must be passed, the four cycles will be explained as follows[20]:

1) The first cycle
   The first cycle includes: Requirements plan life-cycle plan, Risk Analysis, prototype 1, the concept of operation.

2) The second cycle
   If the first cycle is complete. Then it will be continued in cycle 2, including Risk analysis, prototype 2, simulation, models, benchmarks, Software requirements, requirements validations, development plan

3) The third cycle
   The third cycle is carried out if the second cycle is fulfilled, the third cycle includes Risk analysis, Prototype 3, simulation, models, benchmarks, software product design, Design validation and verification, integration, and test plan.

4) The fourth cycle
   The fourth cycle is carried out if the third cycle has been fulfilled. The fourth cycle includes: Risk analysis, Operational prototype, simulation, models, benchmarks, Detailed design, (code, unit test, integration and test, Acceptance test implementation

3. Discussion

3.1. Discussion

This application is named Teacher Attendance Monitoring System Teaching with QR-Code and Geo Location using the Android Platform. This application aims to make it easier for officers and school authorities to control, supervise, and recapitulate teacher attendance. This application consists of several users including teachers, admin staff, administrators, and students. The data needed for this application: teacher data, student data, class data, schedule setting data, teacher schedule data, class data, and teacher attendance reports.
3.2. Analysis

3.2.1. Problem Analysis  At present the teacher attendance process of teaching at some schools has not yet taken the form of an application, where school officials who attend the teacher entering the classroom by going around to each class at each change of subject bring a list of attendance, then the teacher at the class and the hour signs the file.

Based on the current system of teacher attendance, there are a number of shortcomings:

1) The attendance system is still a teacher signature file that can be manipulated.
2) Staff to make teacher attendance must come to each class for schools with a lot of school land and classes require a lot of time and energy.
3) The officer has difficulty in recapitulating the presence of the teacher.
4) The principal is difficult to supervise teachers who enter and are absent during their hours, due to late reporting from the officer.

3.2.2. Risk Analysis The risk analysis conducted by researchers in making this application is lack of resources and lack of facilities, it will affect the process/completion time, cost, and quality in working on controlling prototype applications and the presence of teaching teachers.

To overcome these risks, it is necessary to prepare sufficient resources and costs as well as the personnel who have expertise in accordance with the tasks and responsibilities given, and facilities such as hardware that supports the process of making the application.

3.3. Design

In terms of design, there are a number of process designs and application interface designs made in this study that focus on the interconnected process of teacher teaching presence. for the design process using the UML design that is use case diagram, while for the design of the application interface consists of the teaching schedule page, confirmation of teaching attendance, monitoring of teaching attendance, recap of student attendance, and input of student attendance.

3.3.1. Use case diagram The use case diagram of the application in the teaching attendance process can be seen in the following figure:
Figure 3. Use case diagram of teacher attendance Software design.

Figure 3 shows there are 3 actors namely teacher, student, and picket officer. The teacher actor can view the teacher’s teaching schedule, confirm teaching, input student attendance, and see the student attendance recap. Student actors can only see the schedule for teaching confirmation and the picket officer can monitor the teacher’s teaching presence.

3.3.2. Application Interface  There are several application interfaces made in this study, the pictures are application interfaces that focus on every process of the teacher’s teaching presence:
Figure 4. Designing the User Presence Software user interface.

Figure 4 is the design of the teacher attendance software user interface. In the activity status of the teaching schedule (1), Teaching confirmation scan (2), the input of student attendance (4) and Student attendance recap (5) are interfaces that are accessed by teacher actors, for student actors accessing interfaces on teaching activity confirmation schedule activities (3), while for Monitoring activity teaching attendance (6) is an interface that is accessed by actors picket officers.

3.4. Prototype Design

Based on the design that was made, for the manufacture of this application was made using Android Studio 3.1.3 and the MySQL database. The prototype application of attendance and teaching teachers is as follows:
Figure 5. Designing the User Presence Software user interface.

Based on Figure 5 there are several interfaces that are accessed by the teacher. The teaching schedule status (1) describes the teacher’s teaching schedule on the latest day accompanied by the teaching status. The red symbol means that the teacher has not made a teaching entry, the green symbol "✓" means the teacher has entered attendance, the symbol "✓✓" in blue means the teacher has made attendance to enter and teach teaching, and the alarm clock symbol indicates the schedule of teaching entry. Teaching confirmation scan (2) is an activity for the teaching confirmation scan process, student attendance input (4) is an activity for student attendance input after the successful teaching attendance scan process and Student attendance recap (5) is an activity to see the results of student attendance recapitulation.

Actors students access the interface teaching schedule (3) that is related to the interface (2), the process of scanning performed on the activity (2) of the QR-code contained in the interface activity (3).

Whereas for the picket officer, namely accessing the teaching attendance monitoring interface (6) which describes the list of teachers who teach at the most recent hours accompanied by their teaching status, the red "-" symbol means that the teacher has not made a teaching entry attendance, the green symbol "✓" means the teacher has made the attendance entered on time, and the symbol "✓" has a yellow color means
the teacher has made the presence entered not on time.

3.5. Testing

At this stage is testing of applications that have been made in this study, this test is carried out using the black-box method. This testing method is one of the tests that does not need to know what happens in the application or software. The following is a list of tests performed on the application along with the results of the test:

(a) System Functionality testing

| Testing Details | Result | Percentage of success |
|-----------------|--------|-----------------------|
| Login validation | Valid  | 100%                  |
| Data input validation | Valid  | 100%                  |
| Relationship between activities | OK  | 100%                  |
| Displays teaching schedules according to the schedule of a particular day | OK  | 100%                  |
| Status changes in teaching schedules | OK  | 100%                  |
| Displays QR-code changes on the hourly teaching confirmation schedule | OK  | 100%                  |
| Scan QR-code | OK  | 100%                  |
| Input student attendance | OK  | 100%                  |
| Recapitulation of student attendance | OK  | 100%                  |
| Status changes in teacher monitoring | OK  | 100%                  |

(b) Application Interface Testing

| Testing Details | Result | Percentage of success |
|-----------------|--------|-----------------------|
| Display data on listview | OK  | 100%                  |
| Use the back button  | OK  | 100%                  |
| Save, refresh and an exit button  | OK  | 100%                  |
| Showing data on the spinner | OK  | 100%                  |
| Navigation menu settings | OK  | 100%                  |

4. Conclusions and suggestion

Conclusions from the results of research Teacher Attendance Monitoring System Teaching with QR-Code and Geo Location using the Android Platform can be done. The process of making software includes starting from analysis, design, testing, and is implemented in vocational schools based on spiral software development methods. Besides being able to streamline the time and resources of the software, it can simplify the process of monitoring the presence of teachers in teaching at school.
Suggestions for future research are to evaluate through research by analyzing the percentage of failures and the effectiveness of the use of software that has been designed and built in this research.

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