

Development of Integrated Thesis Guidance Using a Rectangle Model Based on Google Classroom and Mobile Notifications

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Abstract. This study aims to develop an integrated thesis guidance using a rectangle model based on Google Classroom and mobile notifications. Method: This model allows for managing schedules, collecting documents, providing feedback, and tracking guidance progress quickly. The integration of mobile notifications helps students and supervisors receive information about the guidance schedule, comments, or thesis revisions, as well as reminders of tasks to be completed. The software development method is used in this study, starting from the needs analysis stage to the implementation and evaluation of the system. The results of the study indicate that this rectangle model can increase engagement between lecturers and students, facilitate monitoring of theses and progress, and minimize miscommunication during the guidance process. In conclusion, the rectangle model based on Google Classroom and mobile notifications provides an innovative and collaborative approach to the thesis guidance process.

Keywords: Rectangle model, google classroom, thesis guidance, mobile notification, online collaboration

1 Introduction

The development of information technology has had a major impact on various fields, including education. Technology plays a major role as a tool used to facilitate teachers in educating students to achieve the desired results [1]. As we enter a more modern era, technology is also becoming more sophisticated and sophisticated, with more and more media available to help workers and students complete their work. This makes the learning process not limited to direct face-to-face interactions, but can be done online. This provides a great opportunity for educational institutions to utilize technology to increase the efficiency and effectiveness of the learning process[2]. However, although many digital platforms have been used for learning, the thesis guidance process in higher education still often encounters various challenges.

Students in higher education, especially those in the final stages of their education, will be faced with a final assignment in the form of a thesis as a graduation requirement. The thesis guidance process is very important in helping students complete their thesis well and on time. However, in practice, the guidance process often encounters obstacles that hinder communication and collaboration between students and supervisors, which ultimately causes students to experience delays in graduation [3]. Limited face-to-face time is one of the causes because students and lecturers often have busy schedules, making it difficult to find the right

time for direct guidance [4]. In addition, there is a lack of an effective monitoring system. In many cases, lecturers have to manually check the upload of thesis documents, which is time-consuming and sometimes missed. Students also sometimes do not know whether the lecturer has seen their documents or not because of the large number of students[5].

These challenges, if not immediately addressed, can affect the quality of students' thesis results and extend the graduation time. For higher education institutions, this can also reduce the effectiveness of the academic process, especially in the current digital era where efficiency and productivity are the main keys to achieving educational goals. On the other hand, the digital technology available today actually has great potential to overcome these obstacles. One platform that has been widely used in educational environments is Google Classroom. Google Classroom allows teaching and learning activities to be more productive and meaningful by simplifying tasks, increasing collaboration, and fostering communication[6].

Google Classroom offers flexibility and ease of access that allows users to collaborate without having to meet physically. By utilizing the potential of existing technology, a Rectangle Collaboration Communication model based on Google Classroom was developed that is integrated with mobile notifications. This allows lecturers to respond more quickly, provide feedback to students, and monitor thesis progress more effectively. In addition, the mobile notification system integrated in this model also motivates students to be more proactive in the guidance process. By knowing that every progress they make will be immediately known by the lecturer, students will be more motivated to work faster and more efficiently. By optimizing existing technology, it is hoped that the thesis guidance process in higher education can be faster, more efficient, and of higher quality, which will ultimately support students in achieving timely graduation with optimal results.

2 Method

The methodology of this research is based on a literature study that refers to various references and the author's knowledge on this matter. This process involves needs analysis, design, development, system testing and evaluation. Through a literature study, the approach used in this study is based on the method and conceptual framework. Thus, the methodology chosen not only follows applicable scientific standards but also provides a strong theoretical basis for the implementation of this research. The flow of this research can be clearly seen in the framework or diagram presented. The diagram illustrates the stages that are passed during the research process.

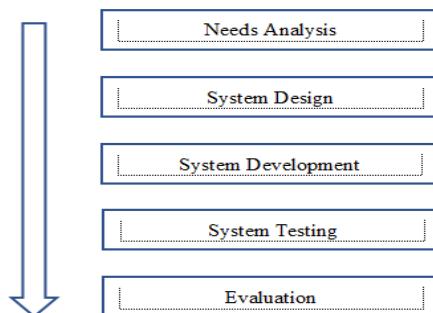


Fig. 1. Research Stages

- a. **Needs Analysis**
This stage aims to identify the needs that must be met or goals in this research both in terms of function and users.
- b. **System Design**
After the needs are identified, this stage focuses on the design of the system that will be studied including the description of the processes and features that must be present in the system [7]
- c. **System Development**
At this stage, the system is designed and implemented according to the design results, including user implementation and system functionality settings.
- d. **System Testing**
After development is complete, the system is tested to ensure that all features or parts are functioning properly and according to the specified needs.
- e. **Evaluation**
This final stage evaluates the results of the system that has been tested, to determine whether the system is optimal and meets the desired objectives.

3 Results and Discussion

3.1 Needs Analysis

Students often face a number of challenges in coordinating guidance with their supervisors, one of the main obstacles is unsynchronized schedules, where students and lecturers often have their own busy schedules, making it difficult to find the right time to conduct guidance. In addition, ineffective communication, such as unclear messages or late responses, can also slow down the guidance process. Technological constraints also play a role, especially when students find it difficult to use the increasingly widely used online platforms, or if lecturers and students are not yet familiar with the technology. All of these factors often make students feel that their guidance is not going well, which ultimately affects their academic progress. Therefore, the use of Google Classroom and a notification system for thesis guidance offers an efficient and structured solution for supervisors and students.

3.2 System Design

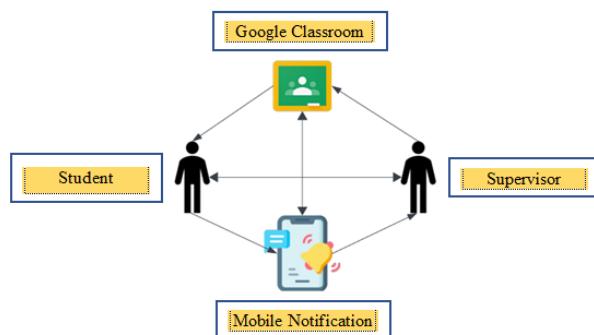


Fig. 2. Communication Rectangle Collaboration Model with Google Classroom and Mobile Notification

The model above illustrates the Rectangle Collaboration Communication model for integrated thesis guidance between students, supervisors, Google Classroom, and mobile notifications. In this model, collaboration and communication between students and supervisors are facilitated by Google Classroom as the main platform. Students and lecturers can communicate with each other through Google Classroom to share documents, receive feedback, or arrange guidance schedules.

3.3 System Development

3.3.1 Supervisor

At this stage, the system will be explained, starting from the system flow designed for the supervisor. This flow aims to simplify the thesis guidance process, from communication to monitoring student progress.

a. Registration and Creation of Guidance Classes

Supervisors can create special classes for each student under guidance through an integrated platform. Each class will be named according to needs, such as "Thesis Guidance" and directly linked to the name of the student concerned.

b. Facilitate communication

The system allows lecturers to organize the guidance schedule effectively by creating Questions manually or utilizing Google Calendar if they want to create an online class for guidance so that students can see and choose the available schedule or discuss if they want to organize the schedule, so that communication between lecturers and students can run more structured.

c. Uploading and Revising Documents

At this stage, the supervisor can create Assignments/tasks in the classroom. The image below shows the Google Classroom interface used to create new assignments. In this section, the instructor is in the stage of providing instructions for Thesis Guidance. Students can upload their documents or drafts of their theses through the system. Lecturers can provide comments, revision notes, or direct input on the uploaded documents. Every revision made will be recorded in the system, so that the improvement process can be followed continuously. After students upload files to the assignment, the supervisor can check the file and provide input or suggestions for improvement to the files uploaded by the student. After checking the file, please click return to return the assignment and the student will receive a notification.

d. Notification Provision

The system automatically sends notifications to lecturers and students regarding guidance schedules, submission deadlines, or revisions that need to be completed immediately. These notifications are also integrated with mobile devices to provide real-time information.

e. Monitoring and Evaluation of Progress

Supervisors can monitor the progress of each student's thesis through the monitoring feature in the system. All data related to guidance to see the results of revisions, and guidance notes, are recorded digitally and can be accessed at any time.

3.3.2 Students

At this stage, it will be explained how the system works from the student's perspective. The flow of this system is designed to make it easier for students to go through the thesis guidance process, from communication to revision management.

a. Registration for Guidance Class

Students will enter a thesis guidance class that has been created by the supervisor. Each guidance class is adjusted to the student's name and the course related to the thesis. Students will receive a class code from the supervisor so they can access the class.

b. Guidance Scheduling

After registering, students can see the guidance schedule that has been set by the lecturer. Students can choose the appropriate guidance time slot or follow the predetermined schedule.

c. Uploading Thesis Documents

Students can upload their thesis draft documents through the system according to the guidance schedule or instructions from the lecturer. The system supports various document formats and will record the date and version of each uploaded document.

d. Revision and Feedback Receipt

After uploading the document, students will receive feedback from the supervisor through the system. Revisions provided by the supervisor can be accessed directly, with specific comments on certain parts of the document. Students must immediately follow up on the revision and upload the revised version.

e. Notification Provision

Students will receive automatic notifications regarding guidance schedules, document submission deadlines, and revisions or input from lecturers. These notifications can also be received via mobile devices to ensure students always get the latest information.

f. Thesis Progress Monitoring

Students can see the progress of their thesis through the monitoring feature in the system. This feature includes guidance history, revisions, and notes from lecturers, so that students can find out what has been done and what still needs to be done. With this system flow, it is hoped that students can more easily manage their thesis guidance process, from uploading documents to completing revisions, and still within the specified schedule.

3.3.3 System Testing

In this system testing, a trial will be conducted to see how effective the file sending process is via Google Classroom. This test aims to evaluate the smoothness and speed of uploading, as well as ensuring that the files sent can be received and accessed properly by teachers.

This test will involve several variables, namely internet speed, file size, and the time required to upload the file. These three variables will be analyzed to see their effect on the effectiveness of the file sending process via Google Classroom. The following is the test data conducted to measure the effectiveness of sending files via Google Classroom. This test involves several files with different sizes and is carried out at an upload speed of 12.0 Mbps. The upload time of each file is measured manually using a stopwatch to ensure the accuracy of the results. The following are the results of the tests that have been carried out:

Table 1. Results of the Tests

No	File Name	File Size	Time
1	Thesis 1	1.21 MB	6.11 second
2	Thesis 2	2.25 MB	7.48 second
3	Thesis 3	6.81 MB	9.59 second
4	Thesis 4	9.01 MB	11.73 second

3.4 Evaluation System

Based on the test results, it can be analyzed that larger file sizes are indeed directly proportional to longer upload times, as expected. This test provides a more realistic picture of the user experience in real situations. The results of this test can be used to evaluate system performance in more depth, especially in terms of the effectiveness of handling file uploads in various network conditions. This is important to improve user experience and minimize problems that may arise during the upload process. Thesis guidance by utilizing Google Classroom can be an effective solution in providing convenience for students and Examining Lecturers, thus the implementation of Google Classroom not only facilitates the guidance process, but also contributes to improving the quality of education as a whole.

3.5 Discussion

This model can be said to be unique because it must be implemented in an integrated manner, according to its title, integrating four elements, namely students, lecturers, the Google Classroom platform, and mobile notifications. One of these four elements must not be absent from the implementation of the model. When one of these elements does not appear in the guidance activity, then the model is not called an integration model.

In its implementation in the field after being tested, it turned out that this was not as easy as imagined. The following is a description, review and results of the trial implementation.

First, students as the object of guidance. Students as the main element in this activity are very easy and flexible in participating in this integrated activity. This is understandable because students are very adaptable to information technology and have high abilities in operating it. They are very close to this world, and it can be said that information technology is already a part of their lives. Students as the object of guidance have a very central role in the learning process and skills development, especially in the era of fast-paced information technology like today. As individuals who are in the phase of identity formation, students tend to have high adaptability to change, including in the application of information technology in various aspects of their lives.

The excellence of students in adapting information technology is one of the main reasons why they are very flexible in participating in guidance activities integrated with technology. Their lives that are already familiar with digital devices, such as computers, smartphones, and the internet, allow them to quickly master the tools and platforms used in the guidance process, be it online learning applications, computer-based simulations, or social media as a means of communication and discussion.

As a generation born and raised in the digital era, students often have a deep understanding of how information technology works. They are not only passive users but also have the

potential as innovators and creators in utilizing technology to support learning. For example, students can use software to analyze data, create creative presentations, or develop collaborative projects involving other group members in various geographic locations.

In addition, students' familiarity with technology also provides great opportunities for educators or mentors to create more innovative and interactive mentoring methods. With technology, mentoring is no longer limited to physical space, but can be done online through video conferencing, online discussion forums, or even the use of artificial intelligence (AI) to provide automatic feedback. This opens up wider access, facilitates communication, and increases time efficiency. However, it should be remembered that even though students have high adaptability to technology, the role of mentoring remains important to ensure that they use technology wisely and productively. Not all students have the same level of digital literacy, so mentors need to provide guidance and support that is appropriate to the needs of each individual. With an effective mentoring approach and optimal integration of information technology, students can be empowered to achieve their full potential, both in academic development and life skills that are relevant to the challenges of the modern world of work and society.

Second, lecturers, as supervisors, this role functions as a guide when students write papers. The guidance is given in three stages, namely the preparation stage, carried out when students first write scientific papers, the guidance stage, carried out when students write and compile their work, and the evaluation stage, this is the final guidance for students where at this time the lecturer comprehensively evaluates the student's work in preparation for carrying out the thesis defense hearing. Lecturers have a crucial role as supervisors in the process of students compiling scientific papers. This role not only helps students in completing final assignments such as theses, but also trains them to think critically, systematically, and academically. In carrying out their duties, lecturers provide structured guidance in three main stages: preparation, guidance, and evaluation.

Preparation Stage. This stage is the initial step that forms the basis of the entire process of creating scientific papers. At this stage, lecturers help students choose research topics that suit their interests and scientific backgrounds. In addition, lecturers provide guidance on relevant research methodologies and how to conduct a comprehensive literature review. The guidance at this stage aims to ensure that students have a strong foundation for starting research, including determining the formulation of the problem, research objectives, and hypotheses if necessary.

Mentoring Stage. This stage is the core process where students begin to write and compile their scientific papers. Lecturers act as mentors who provide regular input on the development of students' writing. At this stage, lecturers evaluate the suitability between the contents of the written work and the theoretical framework, methodology, and data that have been collected. In addition, lecturers also help students improve their academic writing skills, ensure the use of valid references, and encourage them to maintain the originality of their work by avoiding plagiarism. This intensive and collaborative mentoring process aims to build work that not only meets academic standards but also has a contribution value to the scientific field.

Evaluation Stage. This final stage is an important moment where the lecturer conducts a comprehensive assessment of the student's written work. The evaluation includes technical aspects, such as writing structure, clarity of argumentation, and data consistency, as well as substantive aspects, such as depth of analysis and relevance of findings. In addition, the lecturer also prepares students to face the final exam through presentation simulations and Q&A. In this stage, the lecturer ensures that students are able to defend their scientific work with strong and confident arguments. Through these three stages, lecturers not only become academic supervisors, but also become inspirations and motivators for students. The relationship between

lecturers and students during this process not only focuses on completing scientific work, but also forms an attitude of professionalism and academic integrity that will be important provisions for students in the future.

Third, the Google Classroom platform. This platform is one of the most widely used as a digital learning medium. The Google Classroom platform can be likened to a classroom where meetings and interactions between students and lecturers occur. Google Classroom is one of the most widely used digital learning platforms in the world of education, especially in the current era of digital transformation. This platform offers a simple yet effective solution for managing the online teaching and learning process. It can be likened to a virtual classroom, Google Classroom is a place for meetings and interactions between students and lecturers in an organized manner. Google Classroom is designed to facilitate task management, communication, and collaboration between lecturers and students.

As a virtual classroom, Google Classroom creates an interactive learning environment. Lecturers can play an active role in facilitating discussions through announcements or Q&A forums, while students can share ideas, ask questions, and learn from their peers. Even without physical face-to-face meetings, this platform still allows for effective communication, which is an important element in the educational process. However, despite its many advantages, the use of Google Classroom also faces several challenges, such as the need for a stable internet connection, digital literacy constraints for some users, and limited features that may require integration with other platforms for certain needs. Overall, Google Classroom has proven itself as one of the important tools in supporting digital learning, especially in facing the challenges of distance or hybrid learning today.

Fourth, mobile notifications, this is an alarm reminder for guidance activities. One of the advantages of this model lies in this mobile notification. As an alarm reminder, mobile notifications provide direct notifications to the user's device, such as a smartphone or tablet, to inform about various important activities related to guidance, such as meeting schedules, assignment deadlines, or updates from the supervisor.

The advantages of mobile notifications in guidance:

Effective Reminders, mobile notifications function as reminder tools that help students stay organized in managing assignments and guidance schedules. These notifications minimize the risk of forgetting important meeting schedules or deadlines, thereby improving discipline and time management.

Convenience and Accessibility, with notifications directly to mobile devices, users do not need to constantly check the guidance platform. This makes it very easy for students who often move around or have busy schedules.

Quick Response, mobile notifications allow students or lecturers to immediately respond to important updates or messages. For example, if there is a change in schedule or a new document uploaded, direct notifications ensure this information reaches users in real-time. **Increase Engagement**, with consistent notifications, students are more involved in the guidance process. They stay up to date with the latest information, such as lecturer feedback or assignment revision reminders, which encourages them to be active and responsive.

Increase Communication Efficiency, notifications sent via mobile devices ensure fast communication between lecturers and students. If there is an urgent matter, such as rescheduling a meeting, all parties can be notified immediately without delay.

In the context of guidance, mobile notifications can be used for:

Meeting Schedule Reminders, reminding students about the time and location (virtual/physical) of guidance. **Deadline Notifications**, ensuring students know the deadline for submitting revisions or reports.

Important Announcements, providing information about changes to schedules, assessments, or new guidelines from lecturers.

Feedback, notifications about revisions or comments given by lecturers on student documents.

Challenges of Using Mobile Notifications

Although it has many advantages, there are several challenges in implementing this feature, namely:

Notification Overload: Too many notifications can be annoying or cause users to ignore important messages.

Internet Connection: This feature relies on a stable internet network to ensure that notifications are received on time.

Privacy Settings: Some users may feel disturbed if notifications appear at the wrong time.

Mobile notifications are an important element in supporting the success of a digital-based mentoring model. With its function as a reminder alarm, this feature helps ensure smooth communication and coordination between lecturers and students. If used wisely and adjusted

4 Conclusion

Google Classroom can be used as an effective tool for guidance in the learning process. This platform offers various features that support interaction between teachers and students, such as management of teaching materials, assignments, and integrated communication. In addition, the ease of uploading and downloading files, as well as flexible access, make Google Classroom an ideal solution for distance learning and guidance in various conditions. However, despite having many advantages, Google Classroom also still has disadvantages, namely the more files are uploaded, this can affect the storage capacity on Google Drive.

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