International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

Development of Mobile Application-Based Assisttive Technology to Improve Slow Learner Students' Conjecturing Ability

[1]Sutarto, [2]Intan Dwi Hastuti*, [3]Adam Bachtiar, [4]Raden Fanny Printi Ardi
[1]Mathematics Education
Universitas Pendidikan Mandalika
Mataram, Indonesia
e-mail: sutarto@undikma.ac.id
[2]Elementary School Teachers Education
Universitas Muhammadiyah Mataram
Mataram, Indonesia
e-mail: intandwihastuti88@ummat.ac.id
[3]Informastion Technology Education
Universitas Pendidikan Mandalika
Mataram, Indonesia
e-mail: adambachtiar@undikma.ac.id
[4]Informastion Technology Education
Universitas Pendidikan Mandalika
Mataram, Indonesia
e-mail: fannyprintiardi@undikma.ac.id

Abstract—Development of software for mobile applications has grown in significance in the current digital era. The goal of this project is to create mobile-based software that can enhance slow learners' conjecturing skills during the learning process. Rapid Application Development (RAD), a technique well-known for its iterative and collaborative approach, was utilized to create this program. Software development that is quick, flexible, and more user-centered is made possible by RAD. The steps of software development, such as user requirement analysis, application design, implementation, and testing, were discussed in this study. We also emphasize the importance of actively involving users in the development process to ensure that the software meets their needs and expectations. The results of software quality testing show that the software developed meets ISO-9126 standards. It covers important aspects such as reliability, efficiency and usability, earning Good criteria. Meanwhile, only the maintainability and portability aspects received sufficient criticality. It can be concluded that in general the quality of the software developed is good in accordance with ISO-9126.

Keywords- Mobile Application, Assistive Technology, Conjecturing Ability, Slow Learner

I. INTRODUCTION

The greatest way for students to comprehend mathematical proofs is through the job of developing an effective hypothesis, which fosters the imaginative thinking and logical reasoning necessary to generate and support a conjecture (Boero & Douek, 2010). Starting in prekindergarten and continuing through high school, this skill becomes one of the standards of thinking, particularly in mathematical reasoning (Allen et al., 2020; Mayor, 2020). A key component of the mathematical style of thinking, conjecture formulation and investigation is a crucial step in the process of mathematical discovery (Sutarto, Dwi Hastuti, et al., 2022; Kuzle, 2013).

Conjecture is a statement based on empirical facts regarding all possible situations, even with an element of doubt (Sutarto et al., 2020)(Sutarto et al., 2019). The "conjecturing" step, which entails a number of steps including case observation, case structure development, pattern identification and prediction, conjecture formulation, conjecture validation, conjecture generalization, and finally justification of the generalization, is known as the conjecturing process. According to the findings of the "conjecturing" aptitude exam in 2021 at numerous secondary schools in Mataram (Applied Research), 29.6% of students had trouble coming up with hypotheses. A more thorough evaluation by the Mandalika University of Education's Psychological Test and Consultation Institute identified 21.5% of students as slow learners, who typically demonstrate lower learning achievements than regular students (Shaw, 2010; Hasibuan et al., 2020; Tran et al., 2020).

Interviews with students have revealed a number of common challenges they encountered, including: 1) a challenge in understanding abstract concepts; 2) a lack of enthusiasm to learn; 3) a longer learning curve; and 4) the need for repeated explanations. Additionally, it was shown that students with slow learning styles (slow learners), the majority of whom belong to generation Z, are reliant on smartphones and require technological assistance during the learning process.

The creation of assistive technology, which tries to enhance students' capacity to construct hypotheses, is one way to support students who struggle with learning. According to Daroni et al.

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

(2018) and Akpan & Beard (2014), assistive technology refers to technical advancements made expressly to help people with special needs overcome obstacles that are tough for them. The use of assistive technology aims to motivate and entertain students as well as provide continuing support that promotes independent learning and aids in task completion.

Sutarto's extensive research revealed that many students had difficulties coming up with conjectures (Sutarto et al., 2018). In order to solve mathematical issues, the "conjecturing" technique is crucial (Sutarto et al., 2019, 2018; Sutarto, Toto Nusantara, Subanji, 2016). Additionally, it was demonstrated that the creation of PBL-based learning resources enhanced junior high school students' construction skills (Sutarto, Dwi Hastuti, et al., 2022). Assistive technology had the potential to assist students with special needs, according to research so far (Akpan & Beard, 2014; Buehler et al., 2015; Daroni et al., 2018; Morelent, 2015; Wong & Cohen, 2011). Some of this research focused on the design of assistive technology systems in the form of mobile applications. Even though there is a ton of pertinent research, it appears that none of it is focused on the creation of mobile assistive technology applications to enhance slow learners' capacity to construct hypotheses in the context of number pattern content.

In light of the aforementioned setting, the formulation of the research's challenge is how to create learning platforms and assistive technology to enhance the capacity of slow learners to build hypotheses. The assistive technology being considered is based on a mobile application with popup and lock functions, including the capacity to take over the smartphone screen and direct users to complete learning tasks in accordance with a predetermined timetable. A learning platform that comprises a Learning Implementation Plan (RPP), teaching resources, Student Worksheets (LKS), practice questions, and video explanations of the subject matter is also required to support the effectiveness of this application.

II. Review the Literature

A. Assistive Technology

The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are

Through the use of technology-based equipment, assistive technology is a technique to enhance or support the functioning capacities of people with special needs (Wong & Cohen, 2011). In the meantime, according to Buehler and colleagues (2015), assistive technology refers to instruments that help people with special needs complete tasks involving difficult material. According to Daroni et al. (2018) and Sutarto, Hastuti, et al. 2022, assistive technology is a type of technological solution that is specifically made to address problems that people with special needs are unable to solve. The development of assistive technology can take the shape of assisting tools that enhance students' practical skills (Akpan & Beard, 2014).

The assistive technology that will be created basically focuses on mobile applications that can take over user activities and enable them to perform tasks like comprehending the material, finishing worksheets, and answering practice questions. Users should find it simpler to access online resources using their mobile devices thanks to this mobile-based application (Wang et al., 2013). Both parents and children have access to this application. Additionally, this application is made to benefit students who struggle to manage their time and stay motivated to learn consistently and are slow learners.

Its ability to prioritize application performance as being of the utmost importance means that other programs cannot be opened until all of the tasks in this application have been finished. Additionally, this program offers statistics and reports depending on user data. This report covers a variety of topics, including changes in slow learners' skills to complete worksheets and practice problems, as well as the number of questions successfully completed.

B. Conjecturing Ability

Conjecture in this series of studies refers to other conjecture, while "conjecturing" refers to the act of making conjectures. The original term "conjecturing" is used in future explanations. Additionally, conjectures are hypotheses that are generated throughout the process of reasoning but whose veracity cannot be established (Sutarto et al., 2018; Sutarto, Toto Nusantara, Subanji, 2016)(Hastuti et al., 2020). Conjectures, in more precise terms, are hypotheses that are founded on empirical data but remain uncertain due to uncertainty around their veracity (Caadas et al., 2007; Sutarto, Dwi Hastuti, et al., 2022).

Conjecture in this series of studies refers to other conjecture, while "conjecturing" refers to the act of making conjectures. The original term "conjecturing" is used in future explanations. Additionally, conjectures are hypotheses that are generated throughout the process of reasoning but whose veracity cannot be established (Sutarto et al., 2018; Sutarto, Toto Nusantara, Subanji, 2016)(Hastuti et al., 2020). Conjectures, in more precise terms, are hypotheses that are founded on empirical data but remain uncertain due to uncertainty around their veracity (Caadas et al., 2007; Sutarto, Dwi Hastuti, et al., 2022).

A common method of constructing hypotheses is the empirical induction approach from a small sample of cases (Caadas et al., 2007). This conjectural approach consists of the following steps: 1) case observation, which entails examining the specific circumstance that is being presented; 2) organizing cases, which entails applying strategies to group specific examples; and 3) pattern search and prediction, which entails identifying repeated and regular patterns. Create a conjecture based on actual data, even if it contains a little amount of uncertainty. 5. Validate conjectures by taking steps to support conjectures based on specific circumstances but not yet in general. 6) generalizing the hypothesis, which is the act of altering assumptions about the hypothesis in order to apply it broadly; 7) justifying the generalization, which is the action of determining whether the generalization is accurate.

C. Slow Learner

The term "slow learner" refers to children who have little intelligence potential and are below average, despite not experiencing mental illness, according to the Ministry of Women's Empowerment and Child Protection of the Republic of Indonesia's definition, which is outlined in the Regulation of the Minister of State for Women's Empowerment and Child Protection of the Republic of Indonesia Number 10 of 2011 concerning Approaches to Handling Children with Special Needs. According to Krishnakumar et al. (2011), slow learners are defined as kids with IQs between 70 and 90. According to Panday and Kurian (2016), this condition limits the ability of

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

slow learners to pay attention to and concentrate on the material being presented. As a result, they also struggle with long-term memory retention (Tran et al., 2020).

According to a number of studies, slow learners have trouble learning, particularly in the areas of reading, writing, and mathematics (Krishnakumar et al., 2011; Shaw, 2010; Tran et al., 2020). Additionally, they demand frequent explanations and require longer time to comprehend academic information (Shaw, 2010). Additionally, this restriction on the learning process adds to the difficulties slow learners face, which often results in worse learning accomplishment for them than for other students.

It can be difficult for slow learners to articulate their own ideas (Shaw, 2010; Tran et al., 2020). Children with special needs, including those who are slow learners, have a legal right to obtain an education in a classroom setting. The implication is that the learning material provided for ordinary pupils and slow learners is similar.

III. Methodology

The software development life cycle (SDLC) strategy is used to create mobile-based applications that serve as assistive technology for slow learners. One of the Agile approaches for software development, Rapid Application Development, or RAD as it is more often known, was utilized in this study (Daraghmi & Daraghmi, 2022). This development strategy was selected in light of the comparatively quick development time as well as the significant end-user engagement (Mohd Isa et al., 2022).

Additionally, this paradigm offers the benefit of adaptability to meet end users' shifting needs (ZASORNOVA et al., 2022). Additionally, RAD's function as a sustainable software development paradigm is conceivable because to the growing uptake of DevOps approaches (Myint, 2020). The RAD model consists of four development phases, as shown in the accompanying diagram.

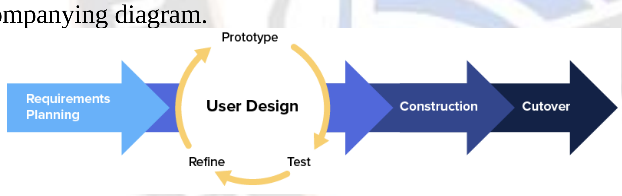

Figure 1. Rapid Application Development (RAD) Model Phase

A. *Requirements Planning*

Requirements Planning is the first stage of the Rapid Application Development (RAD) paradigm, i.e development teams and companies work together to swiftly identify and prepare important application requirements. To lay the groundwork for ongoing development, this process entails gathering requirements, choosing key features, and establishing priorities (Wahyuningrum et al., 2021). During this stage, a system requirements document that has been approved by all parties will be created.

B. *User Design – Rapid Prototyping*

The "Rapid Prototyping" phase of the Rapid Application Development (RAD) paradigm is where the development team swiftly develops an application prototype using the outcomes of the design phase. An initial visual representation of the application's functionality and appearance is provided by this prototype (Gananjaya et al., 2022). The outcomes are then evaluated as part of development testing with the participation of stakeholders. This seeks to swiftly redefine bad user flow or logic. Once all of the primary and supporting features have been designed, the process is repeated.

C. *Construction*

Construction is the third step of the Rapid Application Development (RAD) methodology, where developers work to create application code based on a selected design. At this point, the first software prototype will be improved upon and evolved into a finished product. Teams can more effectively create and integrate application components when they employ contemporary development tools and collaborative approaches. The preparation for quick construction, program and application development, coding and unit testing, and system integration are the four tasks that make up this phase. In this stage, a mobile application that serves as an assistive technology for slow learners is created as the final product.

D. *Cut Over*

The fourth stage in the Rapid Application Development (RAD) model is "Cutover", where the application that has been developed passes the test and evaluation stage and is then fully implemented into the production environment. At this stage, there is a move from development to production, and users begin to actually use the application. Activities such as user training, data conversion, and system configuration and preparation are performed to get the application ready for use. Testing carried out in this phase is testing the functionality of the application, to determine the initial perception of application users.

IV. Result and Discussion

This section describes the process and results obtained from each phase of the Rapid Application Development (RAD) model.

A. *Requirements Planning*

The obstacles that underlie the development of mobile learning applications arise from the limited ability of most students to develop their conjectural thinking skills (Sutarto et al., 2020). Meanwhile, the process of developing conjectures is not only an important step in developing mathematical concepts, but also an essential way of constructing mathematical thinking (Sutarto, Dwi Hastuti, et al., 2022). Students' failure to develop their conjectural abilities is influenced by the condition of students who are slow learners. One of the factors that causes students to become slow learners is the indication that students are addicted to smartphones (Sutarto, Hastuti, et al., 2022). Creating learning aids (assistive technology) for slow learners using mobile application technology is thus the primary requirement for the development of this application.

After recognizing the primary need, the next step in this phase is to determine who specifically will interact with the application. Based on the results of the needs analysis, it is understood that there are three types of users of this application, such as those who are depicted in table 1 below.

TABLE I. Actor and Role Description

No	Actor	Role

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

1	Student	Engaging in educational activities and engaging in dialogue with a teacher
2	Teacher	Create educational resources, oversee their content, conduct evaluations, and engage students in online forums
3	Administrator	User management, both students and teachers

Further analysis was carried out based on the data above to determine an application that best fits each user's function. For students, the type of mobile-based application is determined, while Teachers and Administrators will use a web-based application. Determining the different types of applications is done by taking into account the comfort factor of each user. Based on their role, teachers and administrators tend to be more comfortable when working on web-based applications. While the type of application for students is indeed designed based on mobile because it is to overcome addiction with smartphones and is intended as a tool for students who are slow learners.

Each actor's characteristics are identified after having a clear idea of who they are and what their roles are. Each actor's characteristics are listed in Table 2 below.

TABLE II. APPS FEATURE DEPENDED ON EACH USER ROLE

Feature	Student	Teacher	Administrator
Enrol Course by Token	√		
Scheduled Learning	√		
Assessment and Home Work	√		
Pop up and lock Screen	√		
Discussion forum	√	√	
Course Token Generated		√	
Course Builder		√	
Text Editor		√	
Embed External Resource		√	
Multimedia Integration		√	
Assessment Builder		√	
Track Student Performance	√	√	
Grading System		√	
Management User Role and Permission			√

Pop up and Lock Screen

A pop-up and lock screen feature will be available to users with the Student role. This function is intended to remind you to learn how to perform the assignment by taking over the smartphone screen. Up until the user completes the task, the user's action will be logged once the program has taken control of the smartphone screen. The purpose of this function is to make students study on their own by requiring them to finish reading assignments and tests that the teacher has already planned.

Track Student Performance

Users with both teacher and student responsibilities will have access to the Track Student Performance function. All student learning activities will be recorded using this tool. Each subject's learning activities are recorded, up to the status of tasks that have been completed and those that have not been, as well as grades and comments from the teacher. Through a mobile application, individuals can only monitor their own learning progress, but teachers can monitor the progress of students who enrol in or attend the classes they teach.

Embed External Resource and Multimedia Integration
Users with teacher and student responsibilities will have access to the function called "Track Student Performance." Each student's educational actions will be recorded by this feature. The learning activities that are recorded cover every subject issue, up to the status of tasks that have been completed and those that have not, as well as grades and comments from the teacher that are given to the pupils. Through a mobile application, students can monitor only their own progress in learning, whereas teachers can monitor the progress of students who attend or enroll in the classes they teach.

B. User Design and Rapid Prototyping

Following the first stage's successful formulation of system requirements, the following step is to organize the creation of a mobile learning application. There are three key tasks in this phase: creating user scenarios, creating user flows, and designing the user interface (UI).

User Scenario

Creating a user scenario, which details what each user role may perform within the program, is the first step in this phase. A use case model of each user role is shown in Figure 1 and is followed by a case illustration of that user role.

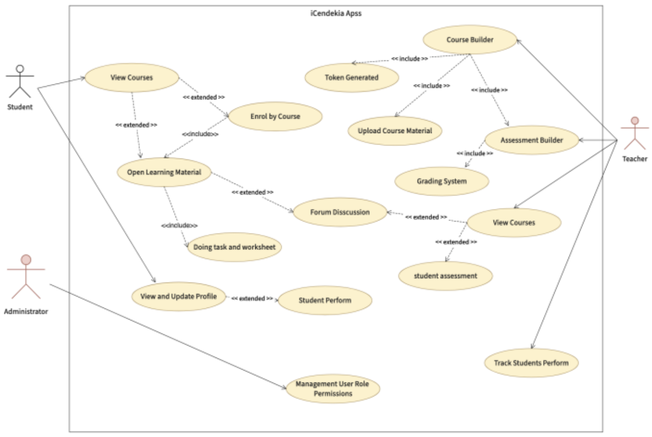

Figure 2. Use Case Diagram for Mobile Application

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

The diagram demonstrates how the Forum Discussion feature allows for direct communication between students and teachers. This function makes it easier to set up collaborative learning environments where interactions between students and their peers and teachers can take place [Citation]. Students must first enter the token in order to access the course. When a user accesses the course for the first time, they only need to enter this token once. As a result, once a student has registered for a course, they can access the course without having to enter their token again.

Teachers can simultaneously develop an assessment builder while using the course builder, which is related to making practice questions and final assignments for the course material. However, the application also offers a question bank function where instructors can independently construct homework assignments and tests without first creating a course. When using the case course builder, where teachers can use the question bank instead of entering their own practice questions and final assignments, this condition can make things simpler for them.

Teachers can benefit from capabilities like a text editor when using the course builder. The text editor tool offers the ability to embed other resources and integrate multimedia, enabling the instructor to include specific files or objects in their lesson plans. These external sources can take the shape of flash animation files kept on websites like PhET Colorado, PDF files stored on Google Drive, YouTube videos, or videos from social media.

When a student has finished registering for a course, a pop-up and lock screen feature go into action. When using the case course builder, this functionality will operate automatically according to the study timetable established by the previous instructor. When the study schedule begins, the program will immediately take control of the student's smartphone screen. Three postponements are allowed for students. On the other hand, if it happens a third time, the program will automatically take control of the screen without offering a different delay option.

Students can use the track student performance function to monitor their learning results after completing the scheduled learning. Teachers can utilize this tool as well as pupils, but there is a difference in the access privileges. While professors may view the learning progress of every student enrolled in the course, students can only see their own learning performance.

User Flow

The teacher, who has been registered by the administration, is the first user of this learning program. Teachers can also utilize the Course Builder functionality to create lessons using their access rights. The course builder feature's instructor process flow is shown in Figure 2. Teachers are required to input the course title, description, learning duration, and URL for the welcome video in the first stage. Once the application has been saved, a token that students can use to access the course will be generated immediately. A component of the Course Token Generated functionality is this procedure.

The teacher can also add content from previously created courses. As often as the teacher owns the material, this procedure is repeated. There is no restriction on how much content a teacher can add to a course. Teachers are prompted to create a course material identification while adding course materials, which consists of the title, description, and URL of the associated learning video. The teacher then establishes the commencement date, the beginning of class hours, and the length of the learning schedule. How long the pop-up and lock screen features occupy the smartphone screen will be measured using the study's duration.

Teachers can include learning support materials. In this process the teacher can use the text editor facility which is equipped with the embed external resource and multimedia integration features. Both of these features can be used by utilizing the iframe feature provided by the text editor.

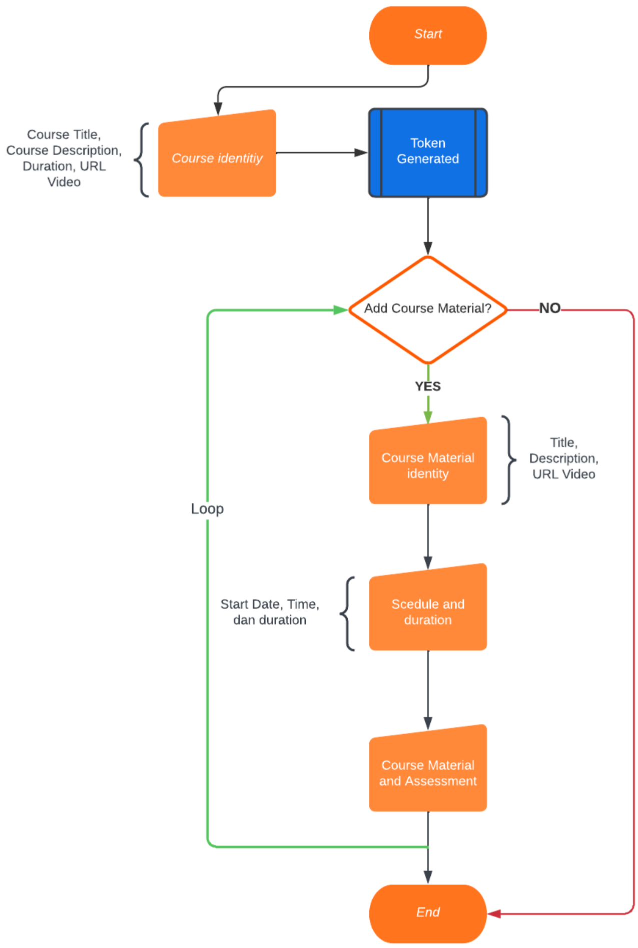

Figure 3. User Flow Proses Course Builder Teacher

Figure 3 shows the student process flow when registering a course by entering the token that has been given by the teacher. After the student has successfully registered on the application, then the student can see the courses available on the application,

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

but to be able to take part in one of the courses the student must enroll the course by token. Students are asked to enter tokens that have been distributed by previous subject teachers. The process of distributing tokens is not carried out by the teacher through the application, but is distributed independently by the teacher to students.

After entering the token, the application will validate the token, if the token entered is incorrect, the application will give an error message. Meanwhile, if the token entered by the student is correct, a valid token message will appear, and the student can access the material from the course.

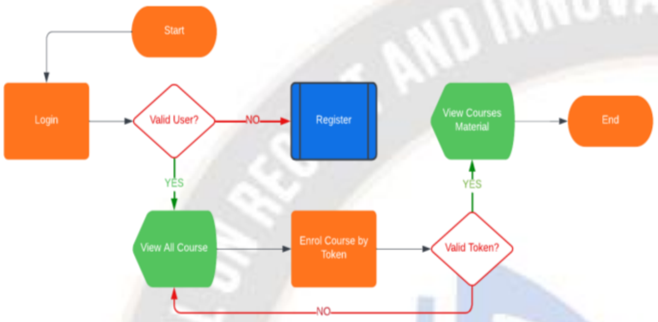

Figure 4. User Flow Process Enrol Course by Token

The process flow of the smartphone features from students' pop-up and lock screens is also shown in Figure 4. After the student completes the token-based course enrollment process, this functionality will function. The application will start to dominate the smartphone screen as the study schedule begins. There is a three-delay policy for students. The program will only give you a five-minute window each time it is delayed before the pop-up and lock screen features resurface.

After the third delay, the student is unable to delay any further, and the smartphone screen is taken over by the application. As long as the designated learning duration is done or the student finishes the learning process before the stipulated learning duration is up, the smartphone screen is taken over.

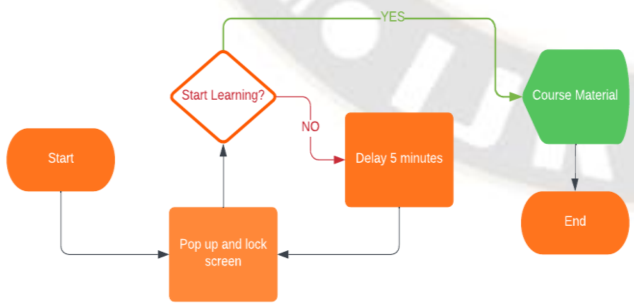

Figure 5. User Flow Process Pop up and Lock Screen Smartphone

User Interface

The application interface is shown in Figure 5 and was created using user flow diagrams, user scenarios, and results from needs analysis. A list of courses that have been enrolled in or are waiting to be enrolled will be visible after a student checks in. When a student selects an already-enrolled course, they are automatically taken to the course materials page rather than having to go through the course by token enrollment process.

Figure 6. Figure 5. Mobile Application User Interface in the Course Enrollment Process by Token and Course Material Access

The user must independently enroll in the course by inputting the token that was provided by the teacher if the student has never taken the course before. Additionally, after completing the enrollment process, the student obtains access to all course materials.

Students can view their learning outcomes every time they finish a course assignment by looking at their grade in the footer area. The student can select the subjects to be studied after entering the grading page, at which point a selection of course materials will show up. The grades of the final assignments that the students have evaluated and finished will be shown in the course materials. If a student selects one of the grade cards, they will be taken to the grade detail page, which includes the final assignment grade and teacher comments for each piece of

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 9
***Article Received:** 25 July 2023 **Revised:** 12 September 2023 **Accepted:** 30 September 2023*

information. Students can communicate with teachers on this page through discussion boards.

C. 4.3 Test Result and Findings

In this research, the software quality was tested based on ISO-9126. The use of ISO-9126 aims to define software product quality, models, quality characteristics, and metrics used to evaluate and determine software quality (Pratama, 2020). There are six factors of software quality according to ISO-9126, namely (Firesmith et al., 2003; ISO/IEC, 2001):

1) Functionality: The ability of the software to provide functions according to user requirements when executed in certain situations.
2) Reliability: The ability of software to maintain a constant level of performance, when used under certain conditions.
3) Usability: The ability of software to be easily understood, learned, used, and attractive to users under certain conditions.
4) Efficiency: The ability of the software to provide performance that is appropriate and proportional to the amount of resources used at that time.
5) Maintainability: The ability of software to be modified, including correction, improvement, or adaptation to changes in the environment, requirements, and functional specifications.
6) Portability: The ability of software to be ported from one environment to another.
7)

Each quality factor in ISO-9126 has different characteristics, divided into sub-characteristics, as in table 3 below.

TABLE III. OPERATIONAL DEFINITION OF SOFTWARE QUALITY MEASUREMENT VARIABLES

Variable	Dimensions/Quality Factors	Indicator
Mobile application-based assistive technology to improve the conjecturing abilities of slow learner students	Functionality	Suiatibility, Accuracy, Security, Interoperability, Compliance
	Reliability	Maturity, Fault tolerance, recoverability
	Usability	Understandibility, Learnability, Operability
	Efficiency	Efficiency, Resource behavior
	Maintainability	Analyzability, Changeability, Stability, Testability
	Portability	Adaptability, Instalability, Coexistence, Replaceability

Based on the operational definition of software quality measurement variables in table 3 above, a list of questions was prepared. Next, the questionnaire was distributed to 62 respondents, consisting of teachers and students. The questionnaire distributed uses Likert scale model answer options. The use of a Likert scale can make it easier to measure a person's attitudes, opinions and perceptions about social phenomena [reference]. Each response is related to the type of question or attitude affirmation expressed in the form of words as presented in table 4 below.

TABLE IV. LIKERT SCALE USED FOR THE TESTING PROCESS

Statement	Description	Score
SS	Strongly agree	5
S	Agree	4
KS	Moderate	3
TS	Disagree	2
STS	Strongly disagree	1

Scores are just symbols and not actual representations of numbers. Furthermore, in the processing and analysis of data, we will use the SPSS (Statistical Product and Solution Services) program and Microsoft Excel to support this task.

There were 23 questions prepared to be distributed to respondents, consisting of 6 questions on the functionality aspect, 4 questions on the reliability aspect, 4 questions on the usability aspect, 3 questions on the efficiency aspect, 3 questions on the maintainability aspect, and 3 questions on the portability aspect. Before distributing it to respondents, the questionnaire was first tested for validity and reliability.

The questionnaire underwent a validity test on 30 respondents, and the results showed that the questionnaire was deemed valid if the correlation coefficient was greater than or equal to 0.3 and the average item score was greater than or equal to 0.5. Additionally, Cronbach alpha was used to assess the questionnaire's dependability. The questionnaire may be deemed credible because the reliability test results were over 0.8, or 0.912 in this case.

After going through the validation and reliability testing process, the questionnaire can be distributed to all respondents. Furthermore, each item in the instrument can be evaluated based on a comparison between the actual score and the ideal score. The actual score is obtained by calculating all the responses given by the respondents according to the value given to each item. On the other hand, an ideal score is calculated by predicting the highest possible score in each item, then multiplying it by the number of questionnaires distributed multiplied by the number of respondents. The formula can be stated as follows:

$$\frac{Actual\ Score}{Ideal\ Score}\ X\ 100\%$$

Where:

Actual Score : Responses from all participants to the questionnaire that was submitted.
Ideal score : Maximum score
These results are then compared with the established criteria and can be presented in Table 5.

TABLE V. CRITERIA FOR PERCENTAGE OF RESPONSE SCORES AGAINST IDEAL SCORES

% Total Score	Criteria
20 – 36	Very Poor
36.1 – 52	Poor
52.1 – 68	Moderate
68.1 – 84	Good
84.1 – 100	Excellent

After the questionnaire is declared valid and reliable, it is then distributed to respondents to measure the quality of the learning application. The results of these measurements are presented in table 6, which describes the respondents' perceptions of the quality of mobile application-based learning software to improve the conjecturing abilities of slow learning students.

TABLE VI. RESULTS OF MOBILE APPLICATION SOFTWARE QUALITY MEASUREMENT

Aspect	Actual score	Ideal score	% Total Score	Criteria
Functionality	2630	3570	73,6	GOOD
Reliability	1780	2380	74,7	GOOD
Usability	1768	2380	74,2	GOOD
Efficiency	1255	1785	70,3	GOOD
Maintainability	1145	1785	64,1	MODERATE
Portability	1113	1785	62,3	MODERATE

Based on the results of quality measurements conducted on teachers and students using ISO-9126, in general the quality of the developed mobile application software has GOOD criteria. However, there are still measurement aspects that receive ENOUGH criteria, namely the Maintainability and Portability criteria.

V. CONCLUSION

The findings of testing software quality using the ISO-9126 standard for producing mobile-based learning applications utilizing the Rapid Application Development (RAD) method demonstrate good accomplishments. Functionality, dependability, usability, and efficiency all satisfy the standard of "GOOD," meaning that this program can deliver a positive learning experience and is dependable, simple to use, and effective when in use. These outcomes demonstrate a dedication to offering high-quality items to aid in technology-based learning.

Even yet, there is potential for improvement in the areas of mobility and maintenance, which nevertheless meet the standards of "MODERATE." This suggests that the program may need to be improved in terms of upkeep and usability in different contexts. In order for this mobile-based learning application to support learning at a higher and more ideal level of quality, there is still need for additional study that has the ability to uncover and get beyond current obstacles.

REFERENCES

[1] Akpan, J. P., & Beard, L. A. (2014). Assistive Technology and Mathematics Education. Universal Journal of Educational Research, 2(3). https://doi.org/10.13189/ujer.2014.020303
[2] Allen, C. E., Froustet, M. E., LeBlanc, J. F., Payne, J. N., Priest, A., Reed, J. F., Worth, J. E., Thomason, G. M., Robinson, B., & Payne, J. N. (2020). National Council of Teachers of Mathematics. The Arithmetic Teacher, 29(5). https://doi.org/10.5951/at.29.5.0059
[3] Boero, P., & Douek, N. (2010). Argumentation and proof: A contribution to theoretical perspectives and their classroom implementation. Proceedings of the 34th Conference of the International Group for the Psychology of Mathematics Education, 1.
[4] Buehler, E., Branham, S., Ali, A., Chang, J. J., Hofmann, M. K., Hurst, A., & Kane, S. K. (2015). Sharing is caring: Assistive technology designs on thingiverse. Conference on Human Factors in Computing Systems - Proceedings, 2015-April. https://doi.org/10.1145/2702123.2702525
[5] Cañadas, M. C., Deulofeu, J., Figueiras, L., Reid, D., & Yevdokimov, O. (2007). The Conjecturing Process: Perspectives in Theory and Implications in Practice. Journal of Teaching and Learning, 5(1). https://doi.org/10.22329/jtl.v5i1.82
[6] Daraghmi, Y. A., & Daraghmi, E. Y. (2022). RAPD: Rapid and Participatory Application Development of Usable Systems during COVID19 Crisis. IEEE Access. https://doi.org/10.1109/ACCESS.2022.3203582
[7] Daroni, G. A., Gunarhadi, G., & Legowo, E. (2018). Assistive Technology in Mathematics Learning for Visually Impaired Students. Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah, 3(1), 1. https://doi.org/10.24042/tadris.v3i1.2406
[8] Firesmith, D., Framework, A. G., ISO/IEC, Kruchten, P., Roadmapping, T., Rinck, J., ISO-IEC, ISO/IEC, & ISO 9126. (2003). ISO/IEC 9126-2 Software engineering - Product quality - Part 2: External metrics. Quality, 3(12).
[9] Gananjaya, I., Chandra, J. O. T., Christanto, J. F. A., Widianto, M. H., & Audrey, J. (2022). "a Lone Burglar" Stealth Game Development Using Rapid Application Development. 2022 4th International Conference on Cybernetics and Intelligent System, ICORIS 2022. https://doi.org/10.1109/ICORIS56080.2022.10031499
[10] Hasibuan, H. Y., Syamsuri, S., Santosa, C. A. H. F., & Pamungkas, A. S. (2020). Profil Pembelajaran Matematika pada Anak Berkebutuhan Khusus Ragam Slow Learner di Kelas Inklusif SMP Garuda Cendekia Jakarta. Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang, 4(1). https://doi.org/10.31331/medivesveteran.v4i1.993
[11] Hastuti, I. D., Surahmat, Sutarto, & Dafik. (2020). The effect of guided inquiry learning in improving metacognitive skill of elementary school students. International Journal of Instruction, 13(4). https://doi.org/10.29333/iji.2020.13420a
[12] ISO/IEC. (2001). ISO/IEC 9126-1:2001 - Software engineering -- Product quality -- Part 1: Quality model. In Software Process: Improvement and Practice (Vol. 2, Issue 1).
[13] Krishnakumar, P., Jisha, A. M., Sukumaran, S. K., & Nair, M. K. C. (2011). Developing a model for resource room training for slow learners in normal schools. Indian Journal of Psychiatry, 53(4). https://doi.org/10.4103/0019-5545.91908
[14] Kuzle, A. (2013). Patterns of metacognitive behavior during mathematics problem-solving in a dynamic geometry environment. International Electronic Journal of Mathematics Education, 8(1). https://doi.org/10.29333/iejme/272
[15] Mayor, J. R. (2020). The Arithmetic Teacher. The Arithmetic Teacher, 1(1). https://doi.org/10.5951/at.1.1.0015

[16] Mohd Isa, W. A. R. W., Suhaimi, A. I. H., Mokhtarudin, A., Luaran, J. E., & Zulkipli, Z. A. (2022). Designing Augmented Reality for Malay Cultural Artifact Using Rapid Application Development. Lecture Notes in Electrical Engineering, 835. https://doi.org/10.1007/978-981-16-8515-6_13
[17] Morelent, Y. (2015). Jurnal gramatika. Jurnal Penelitian Bahasa Dan Sastra Indonesia, 2.
[18] Myint, Z. T. (2020). A Comparative Analysis of Traditional and Agile SDLC Models for Software Development. https://doi.org/10.13140/RG.2.2.10769.45923
[19] Pandey, S., & Kurian, B. J. (2016). An effective way to deal with slow learners: Positive response teaching. IOSR Journal of Research & Method in Education, 6(6).
[20] Pratama, L. (2020). PENGUKURAN KUALITAS PERANGKAT LUNAK PRODI TEKNIK INFORMATIKA UIKA BOGOR MENGGUNAKAN ISO 9126. Jurnal Inovatif : Inovasi Teknologi Informasi Dan Informatika, 3(1). https://doi.org/10.32832/inova-tif.v3i1.4062
[21] Shaw, S. (2010). Rescuing students from the slow learner trap. Principal Leadership.
[22] Sutarto, Dafik, Hastuti, I. D., & Surahmat. (2019). The effectiveness of problem-based learning to improve students' conjecturing ability in solving block-paving problems. International Journal of Scientific and Technology Research, 8(10).
[23] Sutarto, Dwi Hastuti, I., Fuster-Guillén, D., Palacios Garay, J. P., Hernández, R. M., & Namaziandost, E. (2022). The Effect of Problem-Based Learning on Metacognitive Ability in the Conjecturing Process of Junior High School Students. Education Research International, 2022. https://doi.org/10.1155/2022/2313448
[24] Sutarto, Hastuti, I. D., Maulachela, A. B., & Ardi, R. F. P. (2022). An assistive technology to enhance conjecturing abilities of slow learners: a mobile application design. Res Militaris, 12(3).
[25] Sutarto, S., Dafik, Hastuti, I. D., & Surahmat. (2020). An analysis of students' difficulties in conjecturing process of block paving problems. Journal of Physics: Conference Series, 1465(1). https://doi.org/10.1088/1742-6596/1465/1/012073
[26] Sutarto, S., Nusantara, T., Subanji, S., Dwi Hastuti, I., & Dafik, D. (2018). Global conjecturing process in pattern generalization problem. Journal of Physics: Conference Series, 1008(1). https://doi.org/10.1088/1742-6596/1008/1/012060
[27] Sutarto, Toto Nusantara, Subanji, S. (2016). Local conjecturing process in the solving of pattern generalization problem. Educational Reserach and Review, 11(8). https://doi.org/10.5897/ERR2016.2719
[28] Tran, T., Nguyen, T. T. T., Le, T. T. T., & Phan, T. A. (2020). Slow learners in mathematics classes: the experience of Vietnamese primary education. Education 3-13, 48(5). https://doi.org/10.1080/03004279.2019.1633375
[29] Wahyuningrum, T., Fitriana, G. F., Wardhana, A. C., Sidiq, M. A., & Wahyuningsih, D. (2021). Developing Suicide Risk Idea Identification for Teenager (SERIINA) Mobile Apps Prototype using Extended Rapid Application Development. 2021 9th International Conference on Information and Communication Technology, ICoICT 2021. https://doi.org/10.1109/ICoICT52021.2021.9527508
[30] Wang, H.-Y., Liao, C., & Yang, L.-H. (2013). What Affects Mobile Application Use? The Roles of Consumption Values. International Journal of Marketing Studies, 5(2). https://doi.org/10.5539/ijms.v5n2p11
[31] Wong, M. E., & Cohen, L. (2011). School, family and other influences on assistive technology use: Access and challenges for students with visual impairment in Singapore. The British Journal of Visual Impairment, 29(2). https://doi.org/10.1177/0264619611402759
[32] ZASORNOVA, I., LYSENKO, S., & ZASORNOV, O. (2022). CHOOSING SCRUM OR KANBAN METHODOLOGY FOR PROJECT MANAGEMENT IN IT COMPANIES. Computer Systems and Information Technologies, 4. https://doi.org/10.31891/csit-2022-4-1