Ta'awun: Jurnal Pengabdian Kepada Masyarakat
Volume 06, Issue. 01 February 2026, Page. 14-29

E-ISSN: 2774-941X
P-ISSN: 2774-9150

DOI: https://doi.org/10.37850/taawun.v6i01.1164
https://journal.faibillfath.ac.id/index.php/taawun

ENHANCING UNIVERSITY ADMISSION TEST READINESS THROUGH AN ANDROID-BASED CBT PLATFORM IN A SEMI-RURAL ISLAMIC SCHOOL

Indana Lazulfa[1]*, Reza Augusta Jannatul Firdaus[2], Ahmad Heru Mujianto[3], Muhammad Husein Hanafiyah[4], Lilis Karimatun Nisa[5]
[1,2,3,4,5] Universitas Hasyim Asyari Tebuireng, Jombang
email : indanalazulfa@unhasy.ac.id[1)]
* Corresponding Author

Received 12 October 2025; Received in revised form 29 November 2025; Accepted 30 December 2025

Abstrak

Kegiatan pengabdian ini bertujuan untuk memperkuat kesiapan akademik siswa melalui implementasi pelatihan berbasis Android yang terintegrasi dengan materi Ujian Tulis Berbasis Komputer. Metode pelaksanaan mencakup penyusunan modul pembelajaran sesuai indikator SNBT, pengembangan aplikasi mobile dengan fitur Computer Based Test ber-timer dan sistem penilaian otomatis, serta pendampingan penggunaan aplikasi untuk berlatih mandiri. Kegiatan ini diikuti oleh 16 siswa dan 6 guru. Hasil kegiatan menunjukkan adanya peningkatan kesiapan siswa secara signifikan, ditunjukkan oleh 11 dari 16 siswa (68,75%) yang mengalami peningkatan skor pasca-pelatihan dengan rata-rata kenaikan sebesar 20,73% dibandingkan skor pra-tes. Selain peningkatan capaian akademik, siswa juga menunjukkan penurunan kecemasan terhadap ujian berbasis komputer serta peningkatan kepercayaan diri dan kemandirian belajar. Di sisi lain, guru memperoleh peningkatan kompetensi dalam pengelolaan evaluasi digital dan pemanfaatan analitik hasil belajar untuk perbaikan pembelajaran. Kontribusi utama kegiatan ini adalah tersedianya ekosistem CBT berbasis Android yang kontekstual, berkelanjutan, dan sesuai dengan keterbatasan infrastruktur sekolah semi-pedesaan, serta penguatan kapasitas guru dan siswa dalam menghadapi transformasi digital pendidikan. Program ini membuktikan bahwa pemanfaatan perangkat mobile yang telah dimiliki siswa dapat menjadi solusi efektif untuk memperkecil kesenjangan digital dan meningkatkan kesiapan SNBT di lingkungan Madrasah.

***Kata kunci**: Kesiapan Ujian; Literasi Digital; Pelatihan Berbasis Android*; *Seleksi Nasional Masuk Perguruan Tinggi.*

Abstract

The activities aim to improve students' readiness for the admission test through Android-based coaching integrated into simulation-based learning. Activity implementation focuses on developing simulation-based learning modules aligned with university admission tests, integrating m-learning with a computer-based test with automated grading, and coaching students in the use of the applications for self-study. The participants comprised 16 students and six teachers. The activity results showed a significant increase in student readiness: 11 of 16 students (68.75%) increased their post-training scores, with an average gain of 20.73% relative to pre-test scores. In addition to improving academic achievement, students showed a decrease in anxiety about computer-based exams and an increase in confidence and learning independence. On the other hand, teachers gain greater competence in managing digital evaluations and using learning outcome analytics to improve learning. The main contribution of this activity is the availability of an Android-based CBT ecosystem that is contextual, sustainable, and aligned with the limitations of semi-rural school infrastructure, as well as the strengthening of teachers' and students' capacity to navigate the digital transformation of education. This program demonstrates

that the use of students' existing mobile devices can be an effective means of reducing the digital divide and increasing SNBT readiness in the Madrasah environment.

Keywords: Android-Based Coaching; Digital Competency; Test Readiness; University Admission Test.

INTRODUCTION

Educational digital transformation has been a case in point of recent initiatives, especially in Indonesia. The focus has been on improving educational access and on building the required tech-infrastructure for flexible learning (Anggadwita et al., 2024; Kinnula et al., 2023; Stumbrienė et al., 2024). In such an academic environment, the SNBT (*Seleksi Nasional Berbasis Tes* or University Admission Test), a test of quantitative and literacy proficiency and analytical ability in Indonesia, serves. On the one hand, it is a mandatory criterion for entry into the majority of public universities' (state) programmes. It is the sole determinant of public-sector university admission. This situation has made educational self-regulation and efficient automated learning systems mandatory (Useche et al., 2022; Yang et al., 2022), especially in the education sector, with limited digitization, such as schools in semi-rural areas in Indonesia.

However, there are still many Madrasas that face the typical problems of semi-rural Islamic secondary education institutions (Yaqin, 2025). Initial visits to the school indicated that the school's graduates are admitted to universities at fairly low rates (Adiyasman, 2025). Further investigation showed several systemic issues: the school possessed no computers, the internet connection was unreliable, limited digital literacy among the school community was hampering educational progress, and the school offered no training for computer-based testing (Nurhaliza, 2025). While a majority of students possess smartphones, mostly Android devices, their educational use of these phones is virtually non-existent. Instruction is still heavily based on printed worksheets, standard, non-timed, classroom testing, and students therefore have little to no experience in digital forms of testing (Zheng & Bender, 2019). In comparison to the national standard, the competency levels of the students were considerably lacking, and the gap was attributable to the low levels of digital literacy (Zheng & Bender, 2019).

Previous work has confirmed this widely in the case of secondary schools (Fletcher et al., 2020; Liston et al., 2022). In many rural and semi-rural schools, particularly Islamic Schools, there is a struggle to implement digitized learning systems capable of supporting CBT-oriented preparation. Engagement and learning outcomes, however, have been shown to improve with the use of responsive designs and are available at the Android learning platform (Azmi et al., 2020; Sunarto et al., 2020). Additionally, technology has been shown to improve the quality of responses in assessments through automated rubrics (Zheng & Bender, 2019). In contrast, students' digital literacy levels have been shown to affect learning gains from mobile

learning technologies strongly (Hao et al., 2017). These studies demonstrate the value of mobile-based learning. Yet these studies largely focus on general mobile-learning adoption rather than on how disadvantaged Islamic schools can co-develop and sustain CBT systems with their communities.

In this landscape, a critical research-implementation gap becomes clear. There are no studies that design, test, or evaluate community-based CBT systems specifically for SNBT preparation in low-resource Islamic senior high schools. This absence is striking, given the substantial digital divide experienced by madrasahs and the strategic role of SNBT in shaping students' future pathways. MA Ar-Rahman, therefore, represents an ideal setting to introduce an innovative intervention that not only provides an Android-integrated CBT platform but also empowers teachers and builds a sustainable digital learning ecosystem through community participation. The novelty of this program lies in its emphasis on co-created, community-based, Android-integrated CBT design tailored to the constraints of semi-rural Islamic schools, an area that existing literature has not yet addressed. Through this approach, the program aims to improve SNBT readiness, strengthen digital literacy, and contribute to inclusive educational transformation in the Madrasah sector.

METHODS

This community service program was conducted at MA Ar-Rahman Sumoyono, a private Islamic Senior high School located in Sumoyono village, Diwek district, Jombang Regency, East Java. The three-month program, from August to October 2025, targeted Grade XII students and teachers involved in SNBT preparation. The school was selected due to its limited technological infrastructure, low digital literacy, and modest university admission rates, common characteristics of Indonesia's semi-rural Islamic schools (Rachmadtullah, 2020; F. Srinio et al., 2025). The initiative aimed to strengthen students' academic readiness and to establish a sustainable Android-based computerized testing (CBT) learning ecosystem.

A total of 22 participants took part in the program: six teachers responsible for SNBT preparation and sixteen Grade XII students. The school's semi-rural context presented uneven digital access and low classroom technology integration, reflecting structural challenges described in studies on digital divides in Islamic education (Mustafa et al., 2023; Putra et al., 2019). These conditions made the site an appropriate setting for a community-oriented digital capacity-building initiative.

The program followed a community-focused participatory methodology, involving teachers and students throughout the planning, implementation, and evaluation phases. Initial consultations, focus group discussions, and readiness assessments were conducted to identify needs, resource constraints, and

stakeholder expectations, thereby ensuring local ownership and alignment with community-engagement principles (Mathur Grunewald & Foley-Nicpon, 2024).

To maintain consistency and systematic workflow, the program followed a four-stage activity flow over the three-month duration (see Table 1). This workflow aligns with digital learning transformation models in low-resource settings and ensures consistent participant engagement across all phases of the intervention. Based on Table 1, the phases can be described as follows:

Requirement Assessment and Baseline Diagnostics (week 1-2)

Baseline assessments were administered to determine students' academic competencies in reasoning, quantitative literacy, and reading comprehension. Teachers' and students' digital skills were assessed using the European Framework for the Digital Competence of Educators (Caena & Redecker, 2019). Infrastructure surveys documented device ownership, connectivity stability, and computer-lab availability. Findings informed module design and technology requirements.

Table 1. Program timeline for the Android-based SNBT preparation initiative (August – October 2025)

	Phase	Weeks	Activities	Outputs
1-	Requirement assessment and baseline diagnostics	Weeks 1-2	- Initial consultation with teachers and students - Baseline tests on reasoning, numeracy, and reading - Infrastructure survey	- Stakeholder needs map - Baseline academic scores - Infrastructure readiness report
2-	The creation of Learning module	Week 3-5	- Designing SNBT-aligned materials - Creating step-by-step guidance and item for banks materials	- Android-friendly (user-friendly) learning modules - Validated question repository
3-	The Development of Applications, Technology Implementation and Workshops	Week 6-9	- Android CBT app development - Dashboard & analytics setup - Teacher digital literacy workshops - Student CBT practice tutorials	- Running CBT app (auto-graded assessment, timed, randomized) - Teacher-student digital competency improvement
4-	Mentoring, Implementation and Evaluation	Week 10-12	- Weekly CBT practice sessions (twice in one month)	- Learning progress analytics - Post-test report - evaluation of effectiveness

Phase	Weeks	Activities	Outputs
		- Data tracking (accuracy, time, error patterns) - Feedback collection - Post-test assessment	- recommendation for sustainability

The Creation of Learning Module (week 3-5)

Digital learning modules were developed in accordance with the Ministry of Education's SNBT guidelines. Each module integrated conceptual explanations, sample problems, and strategic instructions. The material was structured according to microlearning principles and cognitive load theory to ensure compatibility with mobile or Android-based use (Zheng & Bender, 2019).

The Development of Applications, Technology Implementation, and Workshops (week 6-9)

An Android-based CBT platform was developed that features timed, auto-graded assessments, a randomized question bank, stored learning modules, and analytics dashboards. Subsequently, digital competency workshops were conducted for both teachers and students, progressing from guided tutorials to independent mastery. The workshop emphasized platform navigation, practice-test management, and interpretation of analytics to support targeted remediation. The Android-based CBT platform was developed using a lightweight hybrid framework compatible with low-specification devices. The tools used to create this application were Android Studio, Visual Studio Code, and MAMP. Meanwhile, the tools used for back-end development were Laravel and MySQL. The tools used for front-end development were Flutter.

Mentoring, Implementation, and Evaluation (week 10-12)

Teachers received ongoing mentoring to integrate CBT-based materials into classroom activity practices. Students completed scheduled CBT sessions, where the system automatically logged progress, completion time, and error patterns. Feedback surveys collected perceptions of usability and learning effectiveness. Pre and post-assessment analyses were conducted to evaluate learning gains and identify areas requiring further support. The evaluation instruments consisted of standardized pre- and post-tests designed to mirror the real national SNBT assessment. The tests employed multiple-choice items, and the evaluation employed descriptive statistics.

The timeline demonstrates a sequential and evidence-based implementation in which diagnostics inform module design, technology development, and coaching. Each phase builds upon the previous one, ensuring that the intervention is context-sensitive and addresses both academic and digital-readiness gaps. The structure also ensures sustainable adoption by integrating mentoring and analytics-based evaluation at the final stage.

RESULTS AND DISCUSSION

Initial Findings

A structured Fishbone or Ishikawa diagram, in Figure 1, analysis conducted at the outset of the program revealed four interrelated determinants (Man, Material, Method, and Machine) that collectively hindered students' SNBT readiness. Teachers and students possessed limited digital competencies and lacked familiarity with CBT environments; the school had no standardized TPS modules or digital question banks, instructional practices remained dominated by paper-based worksheets without data-driven remediation, and insufficient devices, unstable internet connectivity, and the absence of a dedicated CBT platform constrained technological infrastructure.

These findings justified the need for an Android-based CBT system integrated with mentoring and module development. Following the intervention, teachers gained hands-on experience with digital assessment management; students became more confident in navigating timer-based CBT tasks; and the overall school environment shifted toward a digitally oriented learning ecosystem. The Fishbone analysis, therefore, not only informed the intervention design but also demonstrated how targeted technological innovation can overcome systemic limitations in resource-constrained educational settings. The fishbone analysis is described in Figure 1.

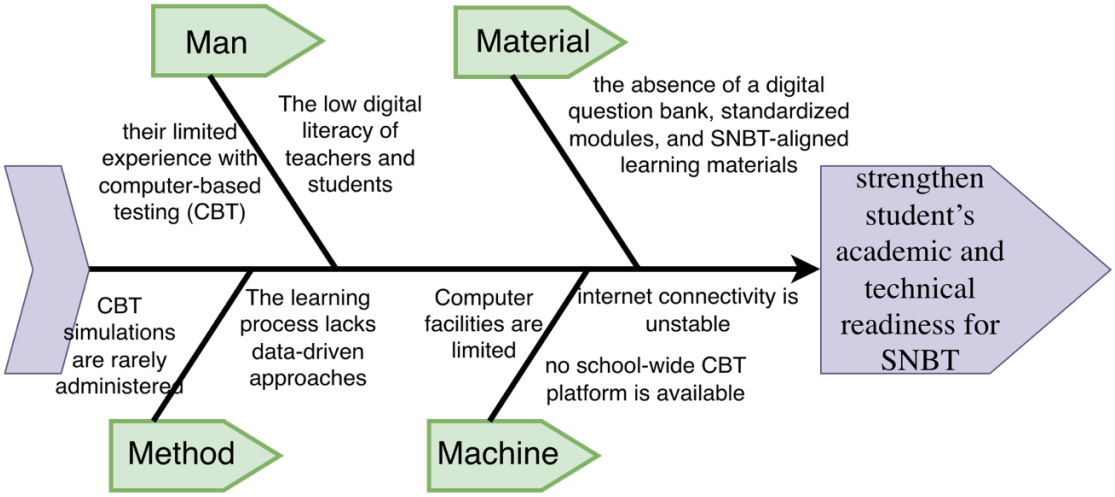

Figure 1. Root Cause Analysis using Ishikawa Diagram

Program Implementation

The program was implemented through four structured stages: baseline diagnostics, module development, Android-based CBT deployment, and guided mentoring and evaluation. Students completed pre-tests, engaged with SNBT-aligned microlearning modules, and practiced regularly using the CBT application. Teachers received training in digital assessment management, interpretation of

assessment analytics, and the integration of CBT sessions into their weekly instruction. Students responded positively to the program, reporting increased familiarity with digital testing, improved confidence in navigating timed assessments, and greater clarity in understanding SNBT question types. Many noted that the CBT platform made practice more engaging and that real-time feedback helped them identify weaknesses more efficiently. Teachers expressed improved readiness to adopt technology in the classroom and appreciated the structured coaching, which enabled them to upload materials, manage tests, and interpret performance analytics independently. They also highlighted that the system simplified monitoring student progress and provided clearer evidence for targeted remediation.

To ensure ease of use for teachers and students at low-resourced madrasahs, the UCD approach considered the users' technology, cognitive profiles, and digital practices. In system design, focusing on users' digital practices, the team first defined the target users through consultations and baseline evaluations. The students have low to mid-range Android devices and have an unstable internet connection, along with weak digital skills, which results in design decisions of ease of use, low memory usage, offline access, and navigation streamlining to take precedence, as described in Figure 2.

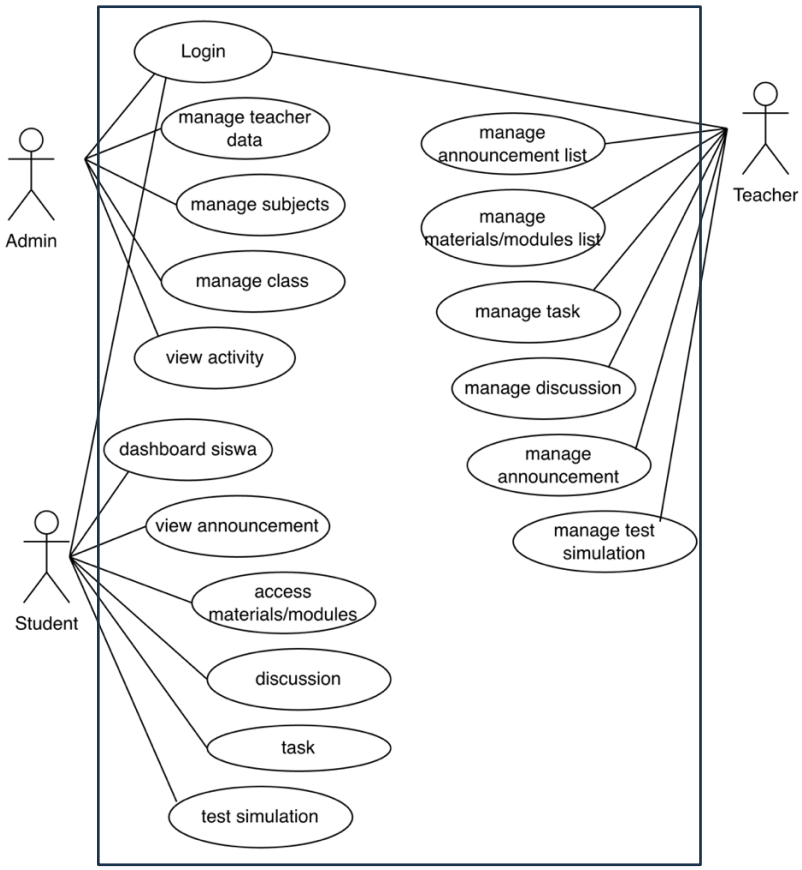

Figure 2. Use Case of Android test-based

The user-centered design approach led the team to align their design goals with the digital practices, device limitations, and learning needs of students from low-resourced, understaffed madrasahs. Step zero of the design was an assessment of user readiness, digital skills, and devices, which indicated that many students had low- to mid-tier devices and limited experience navigating digital assessments. Those insights shaped the development of a user-friendly, low-resource, intuitive design, with a slim architecture and functionalities that resemble those of the national SNBT examination. The application comprised four core modules: instructional content; simulated exams; instant feedback through automated grading; and a teacher analysis dashboard, all tied to the pedagogical SNBT competencies and sub-areas of instruction, mental arithmetics, critical reasoning, and text analysis.

The development phase was also important for students' future readiness. Both teachers and students developed digital competency through workshops and received hands-on practice in which they could use the tools independently. The web app provided a structured classroom session framework and practice, facilitated error reflection, and provided real-time feedback. In the meantime, students could independently complete simulations and keep the practice prep-work, and the school session could be extended. The transition here reflects the shift from being digitally empowered teachers and facilitators to being teachers who use educational technologies digitally and sustainably. The initial menu display in the application is described in Figure 3.

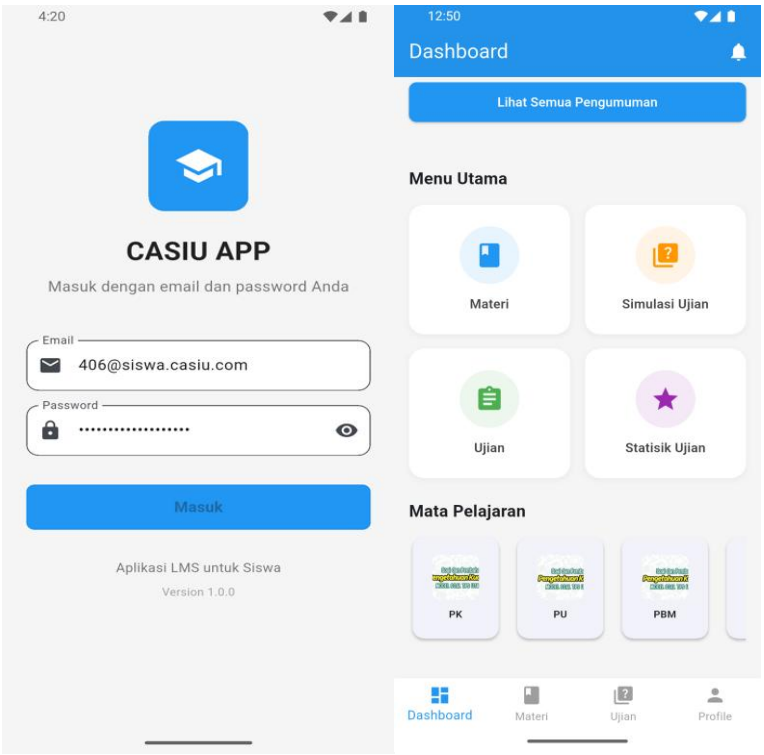

Figure 3. Application's Login Page and Menu Page

Socialization and Coaching on the Implementation of the Android-Based Computer-Based Test (CBT) Platform

Socialization and coaching activities related to the implementation of the Android-based Computer-Based Test (CBT) platform in semi-rural Islamic schools had a positive impact on students' readiness for the university entrance test. At the socialization stage, students and teachers were introduced to the concepts of CBT, digital-based exam mechanisms, and effective problem-solving strategies via Android devices familiar to their daily lives. Communicative and contextual approaches tailored to the school environment help reduce students' anxiety towards technology-based exams. As a result, most participants demonstrated increased understanding of question formats, time management, and technical procedures for administering computer-based exams.

The coaching phase focuses on intensive assistance through test simulations, question discussions, and periodic evaluation of results using the CBT platform. Students are trained to identify academic and technical weaknesses and to develop more targeted self-study strategies. The implementation of this coaching not only increases test simulation scores but also builds students' confidence and learning independence. Overall, the results of the socialization and coaching implementation prove that Android-based CBT platforms are effective in increasing college entrance test readiness for students in semi-rural Islamic schools, while supporting inclusive and sustainable digital transformation. This activity is explained in Figure 4.

Figure 4. Socialization and Coaching of Android App-Based Test for Students

Impact on Participants

The indicators used to measure the enhancement of students' empowerment levels are summarized in Table 2. Of the 16 Grade XII students involved, 87,5% (about 14 out of 16 participants) consistently attended coaching and simulation sessions, with an overall program retention rate of 93,75% (15 out of 16 participants). The access logs recorded through the application showed that students completed an average of 2-3 days of practice sessions per week, indicating high acceptance of mobile-based learning.

Table 2. Mean score of the indicators used to measure the enhancement

No	Indicators	Mean score
1	Retention rate	93,75%
2	Attended participants	93%
3	The access log is recorded each week	1 hour in 3-4 days per week
4	Gap of completion answer pre-post test	28 Question

Influence of the Application

Table 3 presents the average (mean) improvement between the pre-test and post-test scores. Empirical evidence from pre- and post-tests showed that scholastic improvement took place in students. A significant improvement was identified after the intervention, where baseline scores improved from 15.2 to 26.4, marking a 62% increase in overall scores. Table 3 shows the different topics that improved. Moreover, students improved in timed tests in ways that educated guessing, elimination, and time pacing were previously absent. These changes mirror the cognitive and metacognitive growth developed through practice.

Table 3. The Improvement in Pre-and Post-Test Scores, Each Chapter

No	Chapter	Mean pre-test score	Mean post-test score	gap scores pre-post- test
1	Quantitative Reasoning	31.7	52.3	+20.6
2	General Reasoning	40.9	67.3	+26.4
3	Reading Comprehension	73.9	89.1	+15.2

Figure 3 presents the use-case diagram of the developed application, which incorporates three user roles: administrator, teacher, and student. Administrators can manage teachers, subjects, and class data, and monitor user activities. Teachers can upload learning materials, assignments, discussion topics, and examination questions. Meanwhile, students can view their grades and access examinations, learning materials, discussion forums, and announcements.

The use of the application also resulted in behavioral changes among the students. They became more motivated and demonstrated self-discipline in managing their study time. This is evidenced by students' average application login time of approximately 1 hour per 3-4 days spent studying the SNBT modules, as well as the significant improvement in post-test results, as described in Table 3. The values recorded in the application are shown in Figure 5.

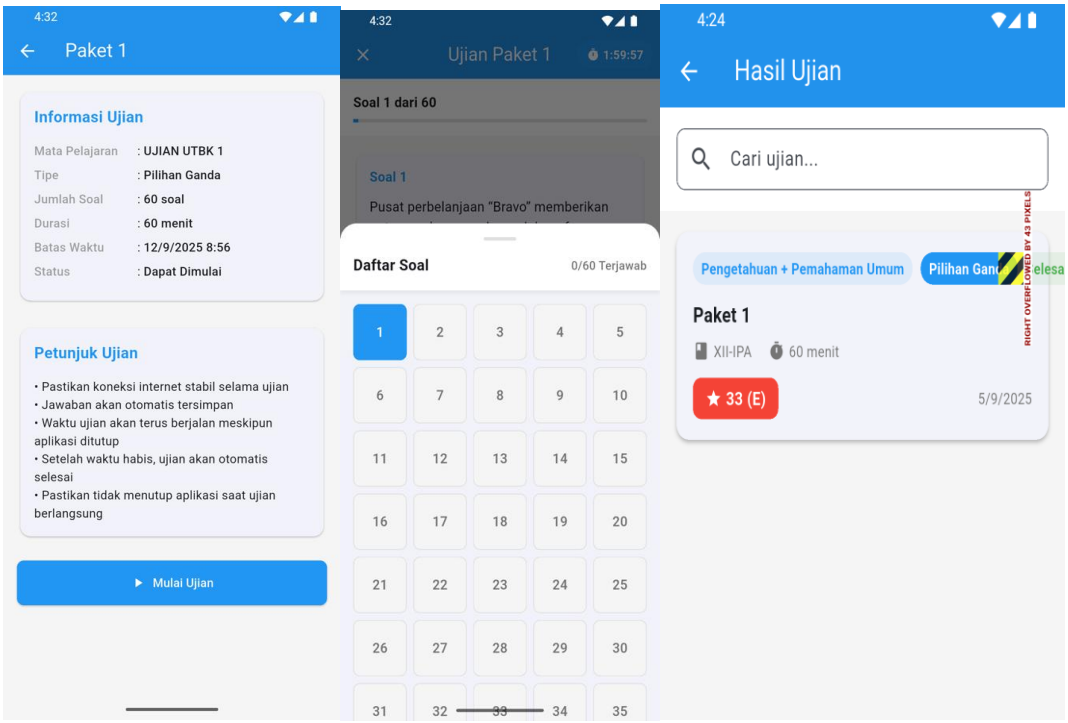

Figure 5. Application's test page and score page

There was also an increase in positive attitudes and a decrease in anxiety toward computer-based exams. The performance data showed consistent, even increasing trends in learning outcomes, confirming the practice's teaching effectiveness. The students who initially struggled and lacked confidence in their digital fluency showed improvement and increased confidence. This suggests that the application was not a test-preparation tool. It was a tool for digital improvement.

In addition to short-term goals, this program provided a basis for long-term viability. The app was fully transitioned to the institution, accompanied by the manual books, SNBT learning modules, and a repository of over 300 blocked questions. The teachers were instructed not only in how to use the app but also in updating the question collections, administering user accounts, and analyzing learning data. Thus, the institution now has the capacity to sustain its digital learning environment independently. Integrating the regular use of CBT for digital diagnostic assessments into the regular teaching of these subjects will become part of the madrasah's CBT leadership's academic calendars. Moreover, the institution plans to deploy the app for junior students; this will likely be the first of many SNBT-focused skill-development and SNBT-style thinking interventions. These ongoing formalizations represent yet another dimension of the system's sustainability, the ability to produce outcomes well after the project ends.

Discussion

Previous studies also emphasize the importance of user participation in technology adoption Fletcher et al., (2020), they often overlook the practical barriers teachers face in incorporating digital tools into everyday instruction. Our

results indicate that structured mentoring and simplified analytics are essential components for sustained adoption, suggesting that participation alone is insufficient without ongoing pedagogical support. Moreover, while earlier research documents the benefits of digital feedback systems, it rarely examines their function in environments with low baseline academic competencies. The significant pre–post gains observed here suggest that analytics-informed remediation may be even more impactful in underserved contexts than previously acknowledged.

These findings align with (Arini et al., 2024; Azmi et al., 2020; Indiany, 2022; Mutambara & Bayaga, 2021; Saputra et al., 2016), who emphasized that mobile learning stimulates student engagement due to its accessibility and immediate feedback features. In this program, the use of personal Android smartphones eliminated the barriers posed by limited computer facilities and enabled simultaneous practice for all participants. This outcome confirms the argument that mobile-first learning ecosystems can mitigate infrastructural constraints in resource-limited schools (Bloom et al., 2018). The improvement was consistent with studies (Huang et al., 2020; Lazulfa et al., 2022) where the routine practice of CBT to mastery was found to improve cognition by familiarizing learners with time-constrained tests and enhancing processing.

Earlier community service programs report improvements in digital literacy, but often note weak adoption among teachers due to platform complexity or insufficient support (Rachmadtullah, 2020). By contrast, the strong uptake observed in this initiative underscores the importance of simplified design and ongoing mentoring, indicating a gap in models that rely solely on initial training. Moreover, while previous studies document the benefits of CBT practice, they rarely examine its integration into instructional cultures dominated by worksheet-based methods. This program demonstrates that analytics-informed remediation can shift teaching practices even in conservative pedagogical contexts, addressing a theoretical and empirical gap regarding how digital tools catalyze pedagogical change in Islamic rural schools.

Overall, this initiative has limitations that affect the strength and generalizability of its findings. The small sample size, absence of a control group, and short implementation period make it difficult to attribute score gains solely to the intervention, especially since external factors such as tutoring or informal study support were not controlled. In addition, the program did not track longer-term outcomes, such as actual SNBT results or university enrollment, because the assessment policy continued to change from year to year.

CONCLUSION AND RECOMMENDATIONS

This community-service initiative shows that Android-based CBT simulations can enhance test readiness, digital competence, and learner agency among students in a resource-constrained madrasah. Post-test improvements and

increased teacher engagement with learning analytics indicate that mobile learning interventions are both feasible and pedagogically valuable when built upon existing smartphone access. The findings align with the literature emphasizing the importance of context-sensitive digital solutions in marginalized educational settings.

To sustain these gains, the school should integrate CBT into routine instructional schedules and continue strengthening teachers' capacity in digital pedagogy. Broader adoption among lower-grade students, collaboration with local educational and technological partners, and future development of adaptive learning features are recommended to expand the program's impact and ensure long-term digital transformation.

ACKNOWLEDGMENT

The authors gratefully acknowledge financial support from the Ministry of Higher Education, Science, and Technology, which enabled the implementation of this community service program. Appreciation is also extended to the leadership, teachers, and students of Madrasah Aliyah Ar-Rahman Sumoyono for their cooperation and active participation throughout the activities.

REFERENCES

Adiyasman, A. (2025). Enhancement of Learning Motivation Through Active Teacher Participation at Madrasah Ibtidaiyah Negeri 6 Pesisir Selatan. *Edu Global: Jurnal Pendidikan Islam,* 6(1), 42–48. Retrieved from https://jurnal.stain-madina.ac.id/index.php/eduglobal/article/view/2240

Anggadwita, G., Indarti, N., & Ratten, V. (2024). Changes in Indonesian private universities educational practices in the post COVID-19 environment. *International Journal of Management Education*, *22*(1). https://doi.org/10.1016/j.ijme.2023.100905

Arini, F. Y., Dwayne, G. S., Araminta, A. N., Alfita, I. N., Ilmana, A. Z., & Adristina, N. (2024). Perancangan Antarmuka Pengguna Interaktif untuk Aplikasi UTBKing dengan Pengembangan. *Indonesian Journal of Mathematics and Natural Sciences*, *47*(2), 74–85. https://doi.org/https://doi.org/10.15294/04t8sj08

Azmi, S., Dewi, R., & Asrial. (2020). The Use of Android-Based Learning Media to Improve Students' Learning Outcomes. *International Journal of Interactive Mobile Technologies*, *14*(6), 210–217. https://doi.org/10.3991/ijim.v14i06.11732

Bloom, T. J., Rich, W. D., Olson, S. M., & Adams, M. L. (2018). Perceptions and performance using computer-based testing: One institution's experience. *Currents in Pharmacy Teaching and Learning*, *10*(2). https://doi.org/10.1016/j.cptl.2017.10.015

Caena, F., & Redecker, C. (2019). Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu). *European Journal of Education*, 54(3). https://doi.org/10.1111/ejed.12345

Fletcher, J., Everatt, J., Mackey, J., & Fickel, L. H. (2020). Digital Technologies and Innovative Learning Environments in Schooling: A New Zealand Experience. *New Zealand Journal of Educational Studies*, *55*(1). https://doi.org/10.1007/s40841-020-00156-2

Hao, T., Dennen, V. P., & Mei, L. (2017). Influential factors for mobile learning acceptance among Chinese users. *Educational Technology Research and Development*, *65*(1), 101–123. https://doi.org/10.1007/s11423-016-9465-2

Huang, R., Ritzhaupt, A. D., & Sommer, M. (2020). The impact of computer-based testing on student performance: A meta-analysis. *Educational Research Review*, *31*, 100357. https://doi.org/10.1016/j.edurev.2020.100357

Srinio, F., Sholihah, M., & Sebgag, S. (2025). Innovation in Learning at Madrasah Ibtidaiyah: Integrating Islamic Values Amidst Tradition and Secular Modernity Debate. *Malaysian Online Journal of Educational Technology*, *8*(2), 353–368. https://doi.org/10.54069/attadrib.v8i2.924

Indiany, L. (2022). *Rancang Bangun Aplikasi GOFISPTN Pendekatan Self Regulated Learning Untuk Simulasi TKA Fisika SBMPTN*. Universitas Islam Negeri Walisongo.

Kinnula, M., Iivari, N., Kuure, L., & Molin-Juustila, T. (2023). Educational Participatory Design in the Crossroads of Histories and Practices – Aiming for Digital Transformation in Language Pedagogy. *Computer Supported Cooperative Work: CSCW: An International Journal*, *32*(4). https://doi.org/10.1007/s10606-023-09473-8

Lazulfa, I., Andriani, A., & Mufarrihah, I. (2022). Pembinaan Kompetensi Kuantitatif Siswa untuk Persiapan UTBK bagi Siswa MA Arrahman Jombang. *Ta'awun*, *2*(02), 222–231. https://doi.org/10.37850/taawun.v2i02.332

Liston, M., Morrin, A. M., Furlong, T., & Griffin, L. (2022). Integrating Data Science and the Internet of Things Into Science, Technology, Engineering, Arts, and Mathematics Education Through the Use of New and Emerging Technologies. *Frontiers in Education*, *7*. https://doi.org/10.3389/feduc.2022.757866

Mailani, Ikrima. dkk, (2024). *Media Pembelajaran*. Sumatera Barat: Afasa Pustaka

Mathur Grunewald, N., & Foley-Nicpon, M. (2024). Exploring the utility of community-based participatory research to investigate mindfulness-based interventions in schools. *Psychology in the Schools*, *61*(1). https://doi.org/10.1002/pits.23059

Mustafa, M., Rohayati, R., Abdullah, A., Alhidayatillah, N., & Astuti, D. P. (2023). From Inequality to Digital Inclusion:Opportunities and Challenges of Digitalization among Santri in Indonesia. *SENTIMAS: Seminar Nasional Penelitian Dan Pengabdian Masyarakat*.

Mutambara, D., & Bayaga, A. (2021). Learners' and teachers' acceptance of mobile learning: An exploratory study in a developing country. *International Journal of Learning Technology*, *16*(2). https://doi.org/10.1504/IJLT.2021.117763

Nisa, R. (2025). Digital Literacy in Islamic Elementary Schools: an Overview of The Factors, Challenges, and Impact 21st Century Skills Development. *Jurnal Cendekia Media Komunikasi Penelitian dan Pengembangan Pendidikan Islam*, 17(01), 334-355. https://doi.org/10.37850/cendekia.v17i01.1025

Nurhaliza, S., Sofendi, S., & Mirizon, S. (2025). Bridging Cultural Identity and Digital Transformation in EFL Classrooms: A Sociocultural Perspective from Indonesia. *Jurnal Pendidikan Progresif,* 15(4), 2538-2568. https://doi.org/10.23960/jpp.v15i4.pp2538-2568

Putra, A. L., Muchtarom, M., & Rejekiningsih, T. (2019). Using digital media in civics education learning subject to develop santri's digital literacy at the age of technology disruption. *International Journal of Engineering and Advanced Technology*, *8*(5). https://doi.org/10.35940/ijeat.E1115.0585C19

Rachmadtullah, R. (2020). Use of blended learning with Moodle: Students' perceptions in Madrasah Aliyah. *International Journal of Instruction*, *13*(2), 171–186. https://doi.org/10.29333/iji.2020.13212a

Rifky, S., Putra, J. M., Ahmad, A. T., Widayanthi, D. G. C., Abdullah, G., Sunardi, S., & Syathroh, I. L. (2024). *Pendidikan yang Menginspirasi: Mengasah Potensi Individu*. Yayasan Literasi Sains Indonesia

Saputra, M. H. Y., Arthana, I. K. R., & Santyadiputra, G. S. (2016). Simatik : Aplikasi Simulasi Bank Soal Tes Potensi Akademik (TPA) Berbasis Multi Platform. *Jurnal Sains Dan Teknologi*, *5*(2), 823–832.

Stumbrienė, D., Jevsikova, T., & Kontvainė, V. (2024). Key factors influencing teachers' motivation to transfer technology-enabled educational innovation. *Education and Information Technologies*, *29*(2). https://doi.org/10.1007/s10639-023-11891-6

Sunarto, M. J. D., Hariadi, B., Sagirani, T., Amelia, T., & Lemantara, J. (2020). MoLearn, a web-and android-based learning application as an alternative for teaching-learning process in high schools. *International Journal of Instruction*, *13*(1). https://doi.org/10.29333/iji.2020.1314a

Useche, A. C., Galvis, Á. H., Díaz-Barriga Arceo, F., Patiño Rivera, A. E., & Muñoz-Reyes, C. (2022). Reflexive pedagogy at the heart of educational digital transformation in Latin American higher education institutions. In *International Journal of*

Educational Technology in Higher Education (Vol. 19, Issue 1). https://doi.org/10.1186/s41239-022-00365-3

Yang, L., Martínez-Abad, F., & García-Holgado, A. (2022). Exploring factors influencing pre-service and in-service teachers´ perception of digital competencies in the Chinese region of Anhui. *Education and Information Technologies*, *27*(9). https://doi.org/10.1007/s10639-022-11085-6

Yakin, Ainul. et al. (2025). The Digital Divide: How Madrasah Uses Technology to Improve Brand Image. *Aktivisme: Jurnal Ilmu Pendidikan, Politik Dan Sosial Indonesia*, 2(1), 189–200. https://doi.org/10.62383/aktivisme.v2i1.760

Zheng, M., & Bender, D. (2019). Evaluating outcomes of computer-based classroom testing: Student acceptance and impact on learning and exam performance. *Medical Teacher*, *41*(1). https://doi.org/10.1080/0142159X.2018.1441984