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ENHANCING SECONDARY EDUCATION: A MOBILE APPLICATION FOR STUDENT PERFORMANCE MONITORING AND CURRICULUM MANAGEMENT

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ABSTRACT

In the realm of modern education, the challenge of managing student information in schools, especially with a growing population, has been a longstanding issue. With the prevalence of mobile devices, particularly among students under the age of 17, leveraging technology to streamline data management has become critical. This study introduces the Monitoring Student Performance in Learning and Curriculum App, a mobile application designed for both students and teachers in secondary schools. The major goal is to improve student performance and facilitate more effective learning management. Utilizing the waterfall methodology, the development of this system progresses through five fundamental phases: requirement, design, implementation, testing, and deployment. This application intends to proactively solve the issues associated with paper-based data storage by empowering teachers to monitor student performance and involvement in lessons and curriculum, thereby fostering a more efficient educational environment.

Keywords: mobile application, student monitoring, secondary education, student management, waterfall,

1.0 INTRODUCTION

Education is a field set for a paradigm shift in an age marked by the exponential integration of technology into every aspect of reality (Ibrahim et al., 2020; Thorn, 2001). Particularly in institutions dealing with sizable student populations, the administration of student information has historically been a problematic effort (Luchagula, 2025; Muleya & Matela, 2025). Several challenges have been imposed on educators and administrators as a result of the outdated dependence on paper-based methods to store essential student information, hindering the effectiveness of management and evaluation procedures (Thorn, 2001; Ibrahim et al., 2020). The conventional approach of storing school-related information on paper not only consumes significant resources but also poses logistical challenges in handling and accessing this data (Amran et al., 2023; Li et al., 2017). This inefficiency is combined when considering the exponential growth in the student population across secondary schools (Nkata, 2020). Additionally, the necessity to closely monitor student performance and engagement in lessons and curriculum adds another layer of complexity to the teacher's role (Ogata et al., 2024; Chen et al., 2019).

Recognizing these challenges, the focus of this study is to introduce and develop the Monitoring Student Performance in Learning and Curriculum App, a mobile application tailored for use by students and teachers in secondary education (Amran et al., 2023; Patel, 2025). Through the development and implementation of this mobile application, the intention is to mitigate the challenges associated with paper-based data storage, foster a more conducive learning environment, and ultimately contribute to the advancement of secondary education (Nikou & Economides, 2016; Chao & Chen, 2009). The core aim is two-fold: to enhance student performance and to streamline curriculum management for teachers (Thelma et al., 2024; Ogata et al., 2024).

The study was conducted based on these three identified issues as follows:

1. **Inefficient data management:**
   Traditional paper-based systems for storing student information in secondary schools lead to inefficiencies in data retrieval, storage, and updates (Thorn, 2001; Luchagula, 2025). The sheer volume of paperwork poses challenges in maintaining accuracy and accessibility, hindering teachers' ability to have real-time insights into student performance, resulting in delayed interventions and less personalized learning experiences (Amran et al., 2023; Ibrahim et al., 2020).

2. **Lack of continued access to student performance data:**
   Access to examination results is limited until they have been delivered to students (Nkata, 2020). Students are unable to monitor their development over time due to the lack of access to historical performance data (Ogata et al., 2024). In the absence of access to past data, students are unable to track their academic progress or identify areas that require improvement (Nikou & Economides, 2016; Chen et al., 2019).

3. **Data redundancy and inaccuracy due to manual entry:**
   The manual collection of student data on paper increases the probability of encountering duplicates and repetition (Muleya & Matela, 2025). This redundancy may result in inconsistent and unclear documentation. For example, if different teachers independently input data, many entries may exist for a single student, resulting in data fragmentation and making it challenging to have an accurate overview (Thorn, 2001; Luchagula, 2025). Handwritten data entries also are prone to human errors, from misspellings to incorrect information (Li et al., 2017). Mistakes made during data entry can propagate through the system and lead to misleading or incorrect student records (Thelma et al., 2024).

The primary problem this study seeks to address is the inefficient management of student data exacerbated by paper-based systems, and the secondary issue involves the need for a more effective method to monitor and enhance student performance in line with the curriculum (Amran et al., 2023; Ibrahim et al., 2020). By employing the Waterfall methodology—including the requirement, design, implementation, testing, and deployment phases—this study details the systematic approach used in the

creation of this innovative mobile application (Muleya & Matela, 2025). The objective is to empower teachers with a tool that not only centralizes student information but also provides insights into individual student performance, aiding educators in tailoring teaching methods to better serve student needs (Ogata et al., 2024; Patel, 2025). Through the development and implementation of this mobile application, the intention is to mitigate the challenges associated with paper-based data storage, foster a more conducive learning environment, and ultimately contribute to the advancement of secondary education (Nikou & Economides, 2016; Chao & Chen, 2009).

2.0 LITERATURE REVIEW

Prior studies have demonstrated the effectiveness of integrating technology into educational systems. Research by (Dijandira et al., 2022; Eshbayev et al., 2023; Eloho et al., 2020 and Torres & Statti, 2019) focuses on the importance of digital inclusion in education and the need for education and technologies to go together for the expansion and organization of knowledge. These studies suggest using technology in education to promote diversity, change pedagogy, and efficiently manage knowledge. They stress the importance of technology in modern education and the need for a harmonic partnership between education and technology to improve learning and knowledge organization. Several studies, such as the work conducted by Stéphane et al., (2023) have highlighted the significance of tools that enable educators to track student progress efficiently, adapt teaching methods accordingly, and intervene promptly to address learning gaps. Existing literature, including studies by Eludire (2011) and Mukred et al., (2019) has addressed the limitations of traditional paper-based data management systems in educational institutions. These studies emphasized the errors, redundancies, and inefficiencies associated with manual data entry and storage, advocating for technological solutions to streamline data management processes.

Additionally, there were a few applications that were already in existence and were being used for educational purposes. For example, the Ministry of Education Malaysia (MOE) designed the School Examination Analysis System (SAPS) to arrange student exam grades. Teachers have access to enter marks into the SAPS application. The parents also can check their children's performance scores through the SAPS Parent Review system. However, the user interface is very old which makes the user feel difficult to use and boring. In addition, users need to enter their school address which makes the entry process very slow.

Figure 1: School Examination Analysis System (SAPS)

Era University has developed a specialized mobile application called the ERA Student Portal. This application acts as an exclusive platform that is tailored particularly for students who are enrolled within the school (Era University). This application serves a variety of goals, including those that are targeted at enhancing the academic journey and administrative experience of the student body at Era University. It functions as a comprehensive student management system. However, one drawback of this application is that it is exclusively utilized by students. The data entered is utilized via a database;

hence, class instructors are unable to access their students' profiles using this application. Data management is restricted to the database administrator and is not available to other users.

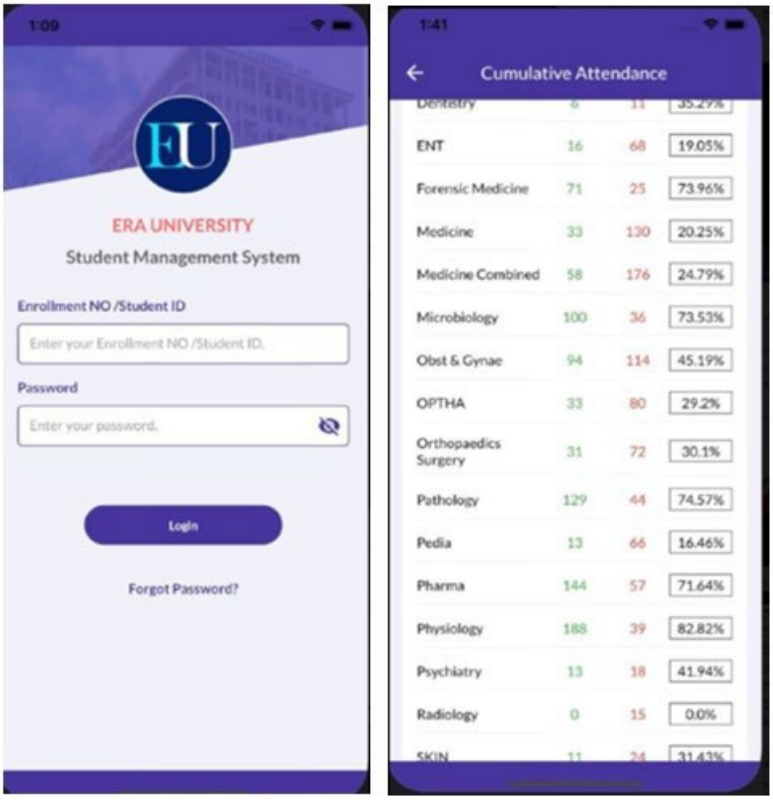

Figure 2: ERA Student Portal

A user-friendly interface and a range of tools that are specifically designed to ease student management activities are provided to teachers by the BROMCOM Teacher App. Teachers are supplied with a user-friendly interface as well as a variety of tools that have been intentionally developed to make activities related to student management more manageable. This is accomplished through the incorporation of features such as student registration, subject allocation, attendance tracking, academic performance monitoring, reporting, and communication.

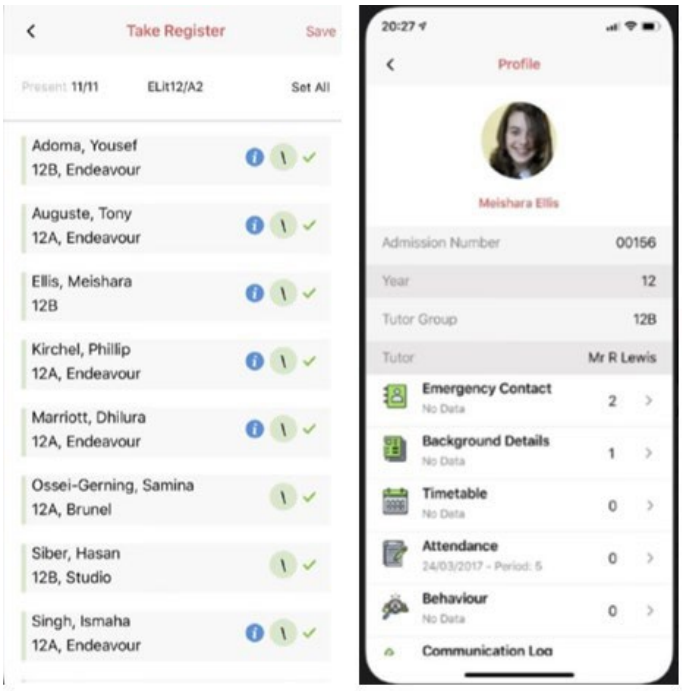

Figure 3: BROMCOM Teacher App

Table 1 illustrates the description summary of existing applications.

Table 1. Summary of existing application

System	SAPS	(ERA) STUDENT PORTAL	(BROMCOM) TEACHER APP
Design	• Plain and outdated • No icons were used • Poor consistency on several pages • The design colour does not match the target user.	• Two contrasting light colours to highlight certain areas • Adequate icons were used	• Simple • Excellent consistency throughout all pages • Several shades of light colours for contrast purposes. • Many icons were used
Features	• Exam slip • Print slip • Selection slip teachers	• Subject registration • Attendance • Course and teachers • Calculate percentage	• Subject registration • Course and teacher evaluation • Account statement • Time table • Attendance
Navigation	Hard to navigate	Quite easy to navigate	Very easy to navigate
Security	Only requires login	Only requires login	Only requires login
User Experience	Bad	Good	Very good

3.0 METHODOLOGY

The waterfall methodology will be utilized to aid the developer in this study because the application that will be produced is a small size and basic project (Bassil, 2012; Senarath, 2021). Aside from the study's modest scale, this approach is suited for progress-focused development owing to the waterfall methodology's linear structure, which allows the developer to meticulously plan the stages before the project's deadline (Saravanos & Curinga, 2023; Adenowo & Adenowo, 2013).

Requirement analysis

All of the application's requirements will be obtained from users during this phase, and an in-depth analysis will be conducted to gain complete knowledge of the demands as described in the project scope (Jaalinoja, 2004; Chari & Agrawal, 2018). Information may be gathered in a variety of ways, including brainstorming, interviews, and surveys (Elghondakly et al., 2015). In this situation, the survey approach utilizing Google Forms is used to obtain the needs and information (Putra, 2025).

Design

The goal of the design phase is to turn the system needs determined in the previous phase into a thorough system architecture or technical blueprint that is viable, resilient, and meets the business requirement (Bassil, 2012; Saravanos & Curinga, 2023). As a result, tasks including physical architectural design, database design, user interface design, and complex class design are used in the design workflow (Adenowo & Adenowo, 2013). Figure 4 depicts the use case diagram for the proposed application that involves students and teachers.

Implementation

This is the phase that receives the greatest attention, as it is the most time-consuming and expensive element of the development process for most applications or systems (Thummadi & Lyytinen, 2020). This is also the phase in which the developers construct the final product using technologies such as programming languages and frameworks that were planned in the previous phase (Rakhmadi & Firdaus, 2025; Sallu et al., 2023).

Testing

The testing phase follows the development phase (Basak & Hosain, 2014). During this phase, the constructed system will be thoroughly tested to ensure that it is operating as intended (Kotagi & Yadav, 2023). All testing operations, such as functional and non-functional requirements, are carried out during this phase to find bugs or malfunctions (Elghondakly et al., 2015). Unit testing is one of the most important stages in the development of a project since the cost of problems may be enormous (Basak & Hosain, 2014).

Deployment

The last phase, deployment, is when the completed product is installed in a real-world context (Bassil, 2012; Hagal et al., 2024). The procedure by which the customer installs the freshly developed and error-free system onto their devices is known as installation (Saravanos & Curinga, 2023). The establishment of a training plan to teach existing and new users how to use the new system or application and assist in managing the changes created by the new system is one of the most significant components of this stage (Pargaonkar, 2023).

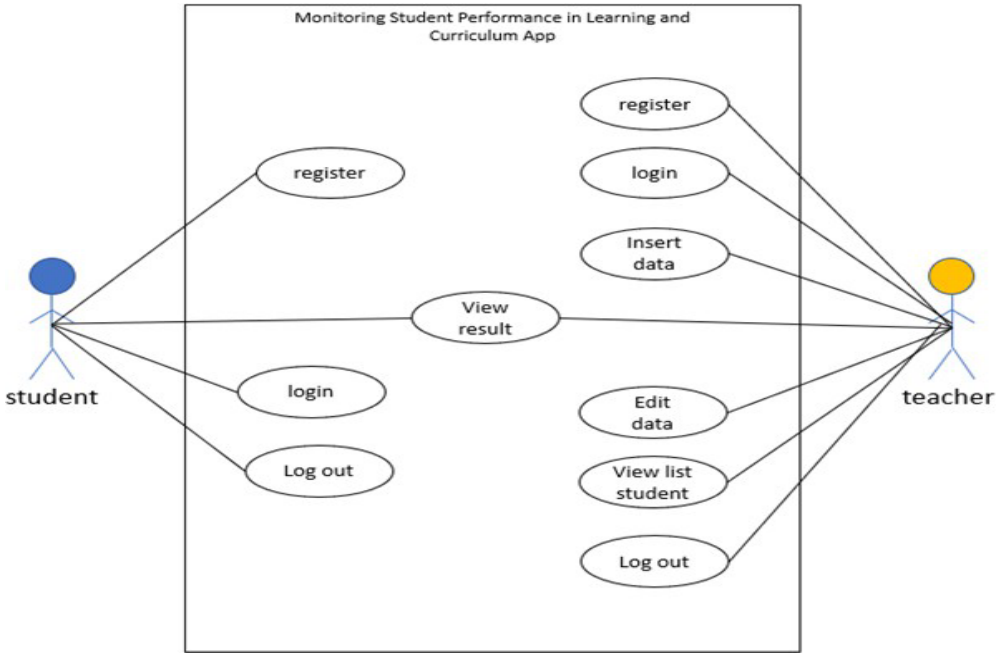

Figure 4: Use case diagram

4.0 PROPOSED SYSTEM

The proposed mobile application for student performance monitoring and curriculum management aims to revolutionize education by offering a comprehensive platform for both students and teachers. This app centralizes student data, allowing teachers to efficiently track performance, monitor engagement, and adapt curriculum delivery to cater to individual learning needs. By leveraging technology, it streamlines administrative tasks, offers real-time insights into student progress, and fosters a more interactive and personalized learning experience for students.

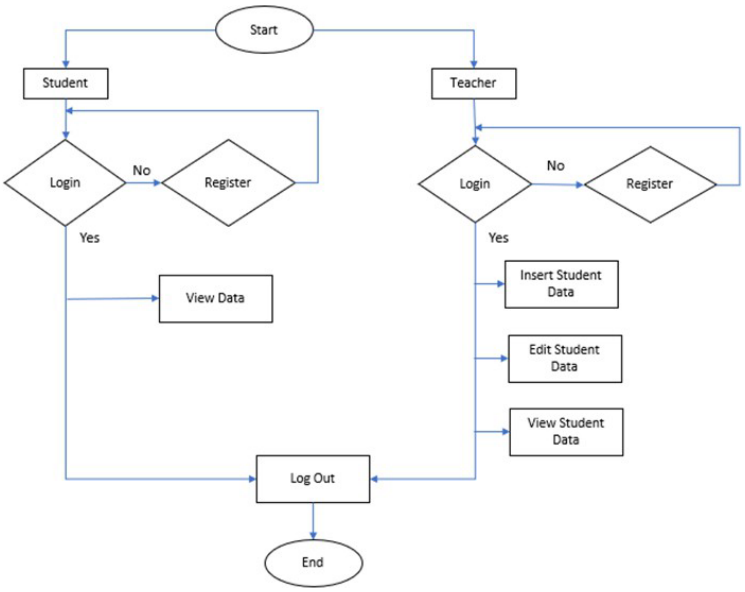

Figure 5: Proposed application process flow

Proposed application process flow shows, there are two types of users proposed to use this system, namely students and teachers. Each type of user has a different module, students can only view data while teachers have 3 other modules which are input, edit and view student data.

The user (teacher) needs to enter the email and password in the input box provided to access the application. Then, the user will be directed to a page that shows a list of names of students who registered for the class led by the user as shown in Figure 6 below.

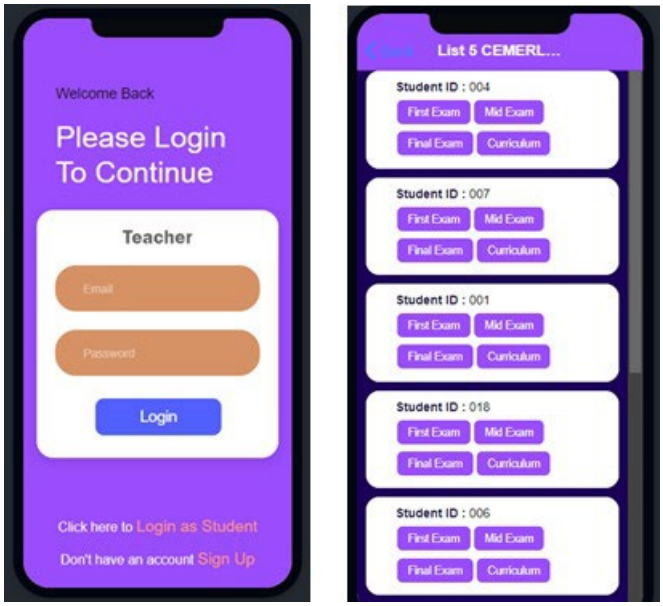

Figure 6: Login and View Student List page

Figure 7 depicts the page of the Insert Final Exam menu that allows users to insert new data subjects for the final exam of a particular student. User needs to fill in the marks of the compulsory subject and the elective subject.

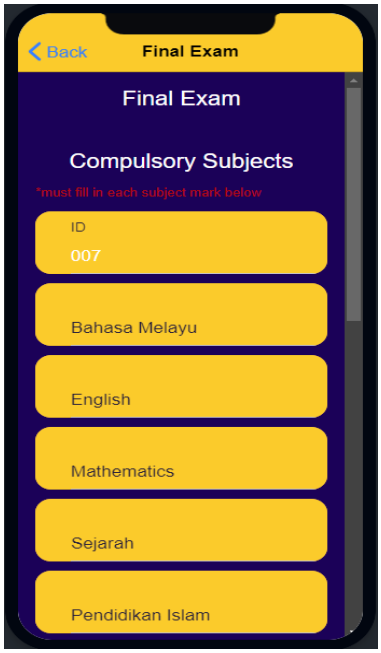

Figure 7: Insert Final Exam page

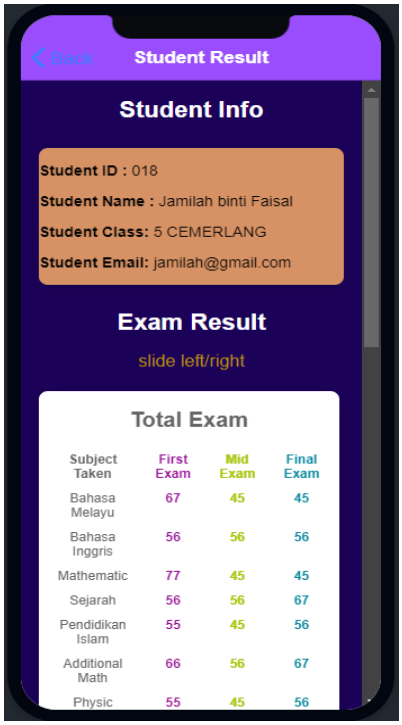

Figure 8: Student Result page

Figure 8 shows the Student Result page where all students' grades are visible to users, and they can see how well each student is performing in each subject.

5.0 CONCLUSION

In conclusion, the development of a mobile application dedicated to student performance monitoring and curriculum management presents a significant leap forward in optimizing secondary education. The introduction of such technology offers a promising solution to the challenges associated with traditional paper-based systems, aiming to streamline data management, improve student performance, and facilitate more efficient learning management for both teachers and students.

Several recommendations are available for enhancing the proposed mobile application:

1. Statistic Chart & Percentage

It is possible to generate subject-specific grades in chart format, including line, bar, and pie charts. The implementation of this chart might further facilitate the thorough monitoring of student exam outcomes. Co-curricular grades will be calculated as a percentage, resulting in a more comprehensive and refined overall curriculum grade system.

2. Attendance page with QR Code features

Enhancing academic achievement using school student attendance can be utilized to enhance student monitoring by quantifying school attendance. A QR code will serve as an indicator of student attendance in the classroom. Students are required to scan the QR code before the start of the subject's class; this can also facilitate the teacher's collecting of attendance records. The inclusion of these functionalities may result in everyday usage of this application since students will be required to launch it each time they enter the classroom.

3. Event Pages for Students

Students can remain informed about school-related matters, including competitions, sports days, exam dates, and more, with the use of an event website. Students become more alert regarding school-related news.

REFERENCES

Adenowo, A. A. A., & Adenowo, B. A. (2013). *Software engineering methodologies: A review of the waterfall model and object-oriented approach*. *International Journal of Scientific & Engineering Research*. https://www.academia.edu/download/119639127/Software-Engineering-Methodologies-A-Review-of-the-Waterfall-Model-and-ObjectOriented-Approach.pdf

Amran, A. N., Badari, K. A., & Abd Samad, N. H. (2023). Enhancing secondary education: A mobile application for student performance monitoring and curriculum management. *The Asian Journal of Professional and Business Studies*. https://journal.uptm.edu.my/index.php/ajpbs/article/view/128

Basak, S., & Hosain, M. S. (2014). *Software testing process model from requirement analysis to maintenance*. *International Journal of Computer Applications*. https://www.academia.edu/download/86233584/pxc3900147.pdf

Bassil, Y. (2012). *A simulation model for the waterfall software development life cycle*. *arXiv Preprint arXiv:1205.6904*. https://arxiv.org/abs/1205.6904

Chao, P. Y., & Chen, G. D. (2009). Augmenting paper-based learning with mobile phones. *Interacting with Computers*. https://ieeexplore.ieee.org/abstract/document/8147231/

Chari, K., & Agrawal, M. (2018). Impact of incorrect and new requirements on waterfall software project outcomes. *Empirical Software Engineering*. https://link.springer.com/article/10.1007/s10664-017-9506-4

Chen, C. M., Wang, J. Y., & Lin, M. (2019). Enhancement of English learning performance by using an attention-based diagnosing and review mechanism in paper-based learning context with digital pen technology. *Universal Access in the Information Society*. https://link.springer.com/article/10.1007/s10209-017-0576-2

Dijandira, F., Ferreira, da Silva., R. F. V. de Oliveira. (2022). The importance of digital inclusion in the educational system. *Revista Científica Multidisciplinar Núcleo do Conhecimento*. https://doi.org/10.32749/nucleodoconhecimento.com.br/education/importance-of-inclusion

Elghondakly, R., Moussa, S., & Hassan, M. (2015). Waterfall and agile requirements-based model for automated test cases generation. *IEEE*. https://ieeexplore.ieee.org/abstract/document/7397285/

Ifinedo, E., Rikala, J., & Hämäläinen, T. (2020). Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT practices and beliefs. *Computers in Education*. https://doi.org/10.1016/J.COMPEDU.2019.103760

Eludire, A. (2011). The design and implementation of student academic record management system. *Research Journal of Applied Sciences, Engineering and Technology, 3*.

Eshbayev, O., & Mulladjanova, N. (2023). Innovating higher education by using education technology and expert systems: Pathways to educational innovation. *International Journal of Social Science Research and Review, 6*, 112–120. https://doi.org/10.47814/ijssrr.v6i6.1217

Hagal, M., Al-Awami, A. F., & Elakeili, S. (2024). A framework for improving software development process hybridization of extreme programming, feature-driven development and waterfall. *IEEE*. https://ieeexplore.ieee.org/abstract/document/10599741/

Ibrahim, F., Susanto, H., Haghi, P. K., & Setiana, D. (2020). Shifting paradigm of education landscape in time of the COVID-19 pandemic: Revealing of a digital education management information system. *Applied System Innovation, 3*(4), 49. https://www.mdpi.com/2571-5577/3/4/49

Jaalinoja, J. (2004). *Requirements implementation in embedded software development* (VTT Publications). https://sarjaweb.vtt.fi/pdf/publications/2004/P526.pdf

Kotagi, V., & Yadav, S. K. (2023). Analysis for requirements testing phase of software development. *SSRN Electronic Journal*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4520340

Li, Q., Cao, H., & Lu, Y. (2017). Connecting paper to digitization: A homework data processing system with data labeling and visualization. *Proceedings of the International Conference on Mobile and Ubiquitous Systems*. https://dl.acm.org/doi/10.1145/3144457.3152353

Luchagula, P. L. (2025). *Teachers' perception on the use of school information systems in managing students' academic progress in public secondary schools at Kigoma Municipality* [Master's thesis, Open University of Tanzania]. Open University of Tanzania Repository. http://repository.out.ac.tz/id/eprint/4974

Mukred, M., Yusof, Z., Alotaibi, F., Mokhtar, U., & Fauzi, F. (2019). The key factors in adopting an electronic records management system (ERMS) in the educational sector: A UTAUT-based framework. *IEEE Access, 7*, 35963–35980. https://doi.org/10.1109/ACCESS.2019.2904617

Muleya, E., & Matela, M. (2025). Paper design and development of a school management system. *Journal of Computer, Software, and Program Development*. https://journals.stecab.com/index.php/jcsp/article/view/423

Nikou, S. A., & Economides, A. A. (2016). The impact of paper-based, computer-based and mobile-based self-assessment on students' science motivation and achievement. *Computers in Human Behavior, 55*, 1241–1248. https://www.sciencedirect.com/science/article/pii/S0747563215301564

Nkata, A. S. (2020). *Education management information system for tracking students' academic progress in secondary schools: A case of Arusha Region*.

Ogata, H., Majumdar, R., Flanagan, B., et al. (2024). Learning analytics and evidence-based K12 education in Japan: Usage of data-driven services for mobile learning across two years. *International Journal of Mobile Learning and Organisation*. https://www.inderscienceonline.com/doi/abs/10.1504/IJMLO.2024.135123

Pargaonkar, S. (2023). *Study of software development life cycle (SDLC) agile & waterfall model advantages, disadvantages, and application suitability in software quality engineering*. *International Journal of Scientific and Research Publications*. https://www.academia.edu/download/106763843/ijsrp_p14015.pdf

Patel, P. (2025). Web and mobile application integration for lecture and laboratory oversight: Smart QR attendance application with location-based features for schools and universities. In *Springer*. https://link.springer.com/chapter/10.1007/978-981-96-6537-2_18

Putra, M. Z. S. (2025). Design and development of a student assessment application based on Android using the waterfall model. *Journal of Informatics Management and Information Technology*. http://www.hostjournals.com/jimat/article/view/694

Rakhmadi, A., & Firdaus, M. I. (2025). A systematic implementation of the waterfall model in e-commerce system development for small businesses. *Conference on Information System and Computing*. http://coins-indocompt.org/coins/article/view/7

Sallu, S., Harsono, Y., & Fajarianto, O. (2023). Implementation of waterfall method in model development to improve learning quality of computer network courses. *JTP-Jurnal Teknologi Pendidikan*. https://journal.unj.ac.id/unj/index.php/jtp/article/view/44418

Saravanos, A., & Curinga, M. X. (2023). Simulating the software development lifecycle: The waterfall model. *Applied System Innovation, 6*(6), 108. https://www.mdpi.com/2571-5577/6/6/108

Senarath, U. S. (2021). *Waterfall methodology, prototyping and agile development*. ResearchGate. https://www.researchgate.net/publication/353324450_Waterfall_Methodology_Prototyping_and_Agile_Development

Sharinath, V. (2019, September 5). 7 mobile-software constraints to factor into your product design. *YourStory.com*. https://yourstory.com/2012/11/7mobile-software-constraints-to-factor-into-your-product-design/amp

Colognesi, S., & Coertjens, L. (2023). Co-creating tools to monitor first graders' progress in reading: A balancing act between perceived usefulness, flexibility, and workload. *Frontiers in Education*. https://doi.org/10.3389/feduc.2023.1111420

Thelma, C. C., Welbeck, B. A., & Sain, Z. H. (2024). The effect of management information system on student academic performance: A case of selected higher learning institutions in Lusaka District, Zambia. *World Journal of Advanced Research and Reviews*. https://www.researchgate.net/publication/386442103

Thorn, C. A. (2001). Knowledge management for educational information systems. *Education Policy Analysis Archives, 9*(47). https://epaa.asu.edu/index.php/epaa/article/view/376

Torres, K. M., & Statti, A. L. (2019). A global perspective of classroom technology integration and use. In *Research Anthology on Developing Effective Online Learning Courses*.