M-Learning Excellence: Personalized Mobile Learning for University Students Via An Android App

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***Abstract*—Nowadays, education is undergoing a significant transformation, driven by the growing influence of mobile applications. These applications can help to bridge gaps in accessibility, offer new and innovative learning approaches, and optimize time management. This work explores the many benefits of mobile applications for both students and educators, focusing on their roles in personalizing learning experiences, enhancing engagement, and revolutionizing higher education through the principles of mobile learning (M-Learning). While M-Learning has the potential to make education more flexible and accessible, its successful implementation requires motivated learners, user-friendly systems, and integration with existing educational structures. The study result reveals the potential of M-Learning to create a dynamic, equitable, and effective educational landscape.**

Keywords— Android App, higher education, m-learning, mobile application, tutoring

I. INTRODUCTION

Mobile applications have revolutionized education by introducing new learning methods, improving information accessibility, and optimizing the learning process. These apps empower learners to engage with educational content at their own pace and in their preferred style, fostering a personalized and effective learning experience worldwide. These applications, created by a range of sources such as prominent corporations and talented developers, provide abundant advantages. They make learning more engaging and enjoyable, leading to better outcomes. The increasing use of mobile devices for learning is attributed to their portability and features facilitating information access anytime, anywhere. Examining mobile learning in detail, it encompasses both similarities and distinctions from traditional e-learning, focusing on devices, technologies, and patterns enabling enriched educational environments free from time and location constraints [1]. Mobile learning (M-Learning) holds promise in transforming higher education by offering convenience and flexibility to students, allowing them to learn at their convenience. It also enables a departure from the rigid classroom setup, granting students greater freedom in learning environments [2]. Furthermore, M-Learning can create innovative educational experiences, providing personalized feedback, interactive activities, and additional resources beyond the classroom. Successful implementation of M-Learning in higher education requires motivating students, employing user-friendly systems, and integrating them seamlessly into existing learning structures and policies [3]. Aligning institutional structures and policies with a mobile education strategy is imperative to harness its full potential, enhancing accessibility and effectiveness in higher education. Despite the prevalence of mobile technology in education, its integration into teaching and research activities remains limited, representing untapped potential for enhancing pedagogical practices and research. Institutions can foster mobile app adoption by offering support and flexibility to educators and researchers [4]. While mobile apps are used for document management, communication, and certain teaching and research tasks, their widespread integration into these settings remains restricted. Encouraging greater institutional support and flexibility could broaden the use of mobile apps for educational purposes. M-Learning's integration of technology into diverse learning environments caters to various learners, complementing traditional classroom settings. It addresses the challenges of traditional learning systems, making it a vital tool for the future of education [5]. Although there is debate about its role in mainstream education, M-Learning's potential to adapt to modern learners' preferences for personalized and concise learning experiences is evident [6].

The objectives of this study were 1) to expand learning opportunities for students both within and beyond the classroom using a Mobile Application 2) to enhance the integration of the application with the conventional classroom learning format, resulting in a more comprehensive learning experience and 3) to address the issue of educational inequality among students through the implementation of the M-Learning concept.

II. LITERATUR REVIEWS

The growing popularity of mobile devices among students presents an opportunity to address the challenges of M-Learning. A new mobile learning system design is presented, leveraging an expanded cloud computing infrastructure enriched with smart devices for educational purposes. The system is designed to be reliable, customizable, and scalable, and can be used in a variety of higher education settings. Mobile apps are transforming education by making it more accessible, flexible, and effective. A new mobile learning system is proposed to tackle existing M-Learning challenges while furnishing superior learning for students. University administrators can use the findings of this system to improve

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the adoption and usage of mobile apps for academic purposes [2].

The integration of educational mobile applications can offer valuable support in the teaching and learning process. Presently, education stands to gain from the adoption of this innovative instructional approach. This approach aimed to conduct a comparative analysis of two instructional approaches and assess the potential impact of mobile applications on the teaching of an engineering subject. These methodologies were applied in a classroom setting, specifically focusing on topics related to IP addressing and network numbering systems. Two student groups, an experimental group, and a control group, participated in the study. Following the conclusion of the experiment, the students' performance was assessed through a questionnaire. The responses from this survey were subjected to statistical analysis, and hypotheses were formulated to investigate whether integrating a mobile application as an educational tool yields learning benefits [3].

Due to the fact that mobile devices offer dependable, personalized, and dynamic computing environments for all users, they are a potential technology for M-Learning. This new framework can be employed in any facet of higher education that demands intensive teaching and learning. The passage further explores knowledge assessment methods, potential issues, and proposes a method for crafting mobile learning applications by utilizing the MIT App Inventor visual programming environment. The outcome introduces an entirely novel pedagogical framework for a mobile learning system within a larger cloud computing environment that is enhanced by smart devices. This architecture is made to overcome the problems with mobile learning and improve the educational experience for university students [7]. App Inventor is a user-friendly tool for developing mobile apps, and online learning communities can provide support and guidance for educators who are learning to design mobile apps. It was discovered that mobile application design activities could signify impactful educational undertakings for teachers having restricted programming knowledge. Peer support and teacher direction helped educators with little programming experience learn to create mobile apps. The sense of community in the online course was praised by the study's educators, who also said App Inventor was a terrific tool for creating practical, fully functional mobile apps. They felt inspired by their friends' personal mobile applications and empowered by the process of creating their own distinctive apps. The learning activities in the course complemented one another to foster a strong feeling of community and create a virtual learning community for mobile app design [8].

Technology that transcends time and space is becoming more and more necessary as the value of information and access to it rises. A promising technology that could offer prospects for lifelong learning is mobile learning. Mobile devices are convenient for use in education because they are compact and packed with features. Additionally, they make it possible for teachers to contact more pupils regardless of time or place. An in-depth overview of mobile learning is presented, highlighting both its similarities and distinctions from e-learning. It also looks at significant concerns like the availability and utilization of the internet in Turkey, mobile learning technology, and communication technologies [9]. The introduction of mobile learning has presented new difficulties for teachers in terms of choosing the right instructional materials. Before incorporating them into the classroom, teachers should be aware of the various functions that different educational mobile applications play in the teaching and learning of mathematics. Then a framework was created for classifying educational apps based on their particular function in the teaching and learning of mathematics as well as the amount of media they contain in order to improve the effectiveness of this process [10].

Mobile learning (M-Learning) is a transformative approach to education that utilizes mobile devices to enhance the learning process. It offers numerous advantages over traditional and distance learning methods, providing learners with unrestricted access to high-quality educational materials and resources, flexibility to learn at their own pace and in their preferred manner, and the ability to curate personalized learning experiences. However, M-Learning faces challenges such as limited access to reliable and affordable internet in certain regions and the need for high-quality M-Learning content development [11]. The potential benefits of mobile learning apps in higher education was highlighted by employing mobile learning strategies, educators can enhance students' academic performance, cultivate positive attitudes toward technology-based learning, and motivate students to engage more actively in the learning process. Researchers and practitioners should explore and adopt mobile learning approaches to optimize educational outcomes [12].

Grab a Tutor was successfully developed as a mobile application to address the need for a user-friendly platform connecting parents with suitable tutors for their children. The app adheres to established standards and incorporates a comprehensive set of features to streamline the tutoring search process. The implementation of modern technologies and standardized development practices ensures the app's reliability and effectiveness [13]. User research including needs assessment and UX testing was undertaken with undergraduate students acting as both tutors and tutees. This was done to guarantee the planned peer-to-peer mobile app caters to user requirements and preferences. Various UX methodologies, including service blueprints, MVPs, affinity mapping, and user personas, were employed to understand peer tutoring needs, user goals, user behaviors, and user experiences. Interviews with student tutors and tutees provided further insights into their experiences and perspectives on using a mobile app for peer tutoring [14].

Leveraging mobile app development tools in computing courses can effectively engage students, foster problem-solving skills, and improve attitudes towards computing. The project-based approach, coupled with the use of GameSalad, resulted in significant gains in student engagement, problem-solving skills, and positive self-perceptions of computing. While concerns regarding platform dependence and software updates were raised, the overall positive outcomes underscore the value of incorporating mobile app development into introductory computing curricula [15]. The data-gathering techniques was improved for precisely evaluating university students' mobile application usage patterns during class time. It was carried out as a component of a broader PhD research project. The study's findings suggest that app usage is prevalent in theoretical classes, particularly social networking apps, and that students' self-reported app usage is often underestimated. The study highlights the importance of employing robust data collection methods to capture accurate insights into student mobile application usage behaviors [16].

The experiences of educators with limited programming knowledge were examined as they learned mobile app design through peer support and instructor guidance. The findings underscore the positive impact of peer support and web-based visual programming tools in fostering a sense of community, empowering educators, and promoting creative problem-solving. The study also demonstrates the effectiveness of teaching and learning mobile app design in an online setting, encouraging educators to explore and integrate these design learning activities into their teaching practices [17].

Limited adoption of mobile apps among educators and researchers underscores the need for a robust support system to promote wider usage and effective application. Libraries, particularly academic libraries, are well-positioned to provide this support. Mobile apps are primarily used for research purposes, with communication, collaboration, and sharing serving as key motivators. While users acknowledge the potential benefits of mobile apps, they remain uncertain about their impact on teaching and research practices. The survey findings demonstrate the transformative potential of mobile apps in education and call for further exploration of their impact on teaching and research outcomes [18]. Mobile devices represent a dramatic departure from traditional computing platforms. Unlike static desktop computers with predictable contexts, mobile devices enable dynamic and comprehensive integration into educational settings. Mobile learning is an emerging area of research with potential to enhance overall learning experiences for students and teachers. Mobile learning can advance eLearning systems as the next generation of anytime, anywhere accessible learning. Benefits highlighted include enhancing traditional learning methods by enabling new contexts, interactions, and assessments. However, challenges remain regarding effective instructional design, privacy/security, device limitations, and ensuring equitable access. Overall, mobile learning promises more customized, engaging education if purposefully leveraged, though continued evolution of devices and best practices is needed [19].

Android application using the Java programming language was developed. This application serves as a crucial component of the 4th-year student Internship project within the Information Technology program at Suan Sunandha Rajabhat University. The application seamlessly interfaces with a web server hosted on an Apache webserver and leverages a MySQL database to efficiently manage data stored in the form of structured table relationships. One noteworthy feature of this application is its robust back-end management system. This system empowers key stakeholders involved in the Internship project, granting them the capability to exert control. Advisors and partnering companies responsible for accepting students for internships can efficiently manage and oversee the application's operations through this intuitive interface. This application is innovative Android application serves as a testament to the dedication and technological prowess required to streamline the management of this significant academic initiative [20].

III. METHODOLOGY

A. M-learning

M-Learning, which deviates from the traditional classroom-based model and ushers in an era of learning that is time- and space-independent, offers a disruptive approach to education. By utilizing the power of mobile devices, this ground-breaking approach gives students free access to educational materials and content anytime and wherever they want. Structured frameworks are the building blocks for creating M-Learning applications, and they are at the heart of M-Learning. These frameworks cover essential components like establishing learning objectives, figuring out the distinctive qualities of the target audience, selecting the best educational resources and content, creating interesting activities and assessments, and choosing the right delivery method for maximum accessibility. The M-Learning paradigm is based on a set of core principles that define its ethos and set it apart from conventional learning methods. Ubiquitous dominance prevails as long as M-Learning applications remain easily accessible on mobile devices. Personalization is essential because it enables the learning experience to be adjusted to meet different learning preferences and styles. M-Learning settings encourage contact between students and instructors as well as peer-to-peer collaboration, which thrives there. Through the use of interactive features to maintain motivation, activity-driven engagement enthralls students. Last but not least, authenticity directs M-Learning activities, providing chances for students to use newly acquired knowledge in practical settings. Beyond mere innovation, mobile learning has the ability to completely transform the way that people learn by making it more accessible, affordable, and interesting. It aims to customize educational opportunities and make them pertinent to the particular requirements and goals of each learner. By embracing mobile learning, we begin on a revolutionary educational journey that transcends space and time and provides countless options for knowledge acquisition and individual development.

B. System architechture

The proposed mobile learning platform leverages the ubiquity of smartphones and internet connectivity to provide accessible educational content independent of location and time constraints. This system is comprised of learners, mobile devices, data storage and services that enable dynamic learner-content interactions. Learners stand central, exemplifying the learner-centric ethos, while smartphones act as the predominant access point, mirroring their widespread adoption. Effective data retrieval and storage is enabled through integrated cloud infrastructure. Supporting services facilitate meaningful exchanges between learners and learning materials. Robust two-way communication channels contribute responsive and adaptive learning experiences. Collectively, these interlinked components underscore a comprehensive framework focused on empowering learners through intelligent, engaging mobile learning architectures as shown in Fig.1. The aim is personalized, self-directed yet socially-connected education unconfined by traditional limitations. When thoughtfully implemented, such systems promise more equitable and effective learning paradigms customized to individual needs and preferences.

C. Mobile Application Evaluation

In this study, thirty undergraduate students from Suan Sunandha Rajabhat University or SSRU, Thailand were actively engaged as participants. To commence their involvement, each student initiated the process by installing the application and subsequently activating their account through the provided registration email as shown in Fig.2. The cohort of participants assumed the role of tutees, engaging in the experience of following a tutoring course provided by a university lecturer from SSRU, who acted as a tutor.

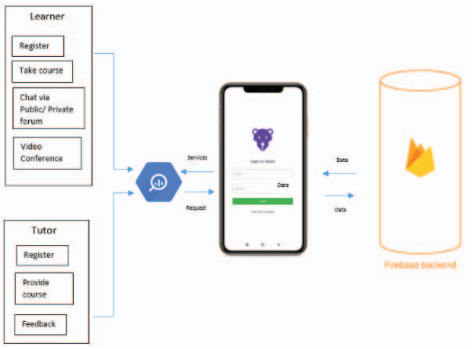

Fig. 1. Key components and work flow diagram of the proposed mobile application

To ensure uniformity in app utilization, all students underwent comprehensive training aimed at equipping them with the necessary skills to effectively navigate and utilize the application. During the trial phase, which spanned a duration of 30 days, all participating students diligently employed the application. To comprehensively assess the app's performance and gather valuable insights, students were invited to share their feedback through an online questionnaire provided on Google Forms. Furthermore, to delve deeper into their experiences and perspectives, a focus group interview was conducted to solicit more detailed and insightful information.

IV. Results

The user interface encompasses sequential registration procedures tailored for new users. Additionally, it includes a login screen facilitating access to the application, wherein users can engage in text-based chat exchanges within public or private message boxes. This interactive feature fosters communication between both students and instructors or tutors. Instructors are provided with the functionality to select video-based instructional content, sourced from YouTube, which can be seamlessly integrated into their dedicated teaching channels. Additionally, instructors have the capability to provide supplemental PDF materials such as lecture slides, notes, assignments, and readings to further enrich the learning resources. By coupling engaging video lessons with downloadable PDFs for offline study, instructors can provide a comprehensive set of dynamic learning materials catered to different student needs and preferences as shown in Fig.2. Students benefit from multimedia course content that combines visual, auditory, and text-based resources to support a wide array of learning styles. This expanded set of instructor tools aims to facilitate more effective and well-rounded mobile learning experiences. Furthermore, the application offers a video chat feature, enabling bidirectional communication between instructors and students. This facilitates real-time interactions, encompassing conversation exchange and screen-sharing capabilities. Notably, the application incorporates the Google Meet service, thereby eliminating the need for separate utilization of the Google Meet application as shown in Fig.3. This strategic integration enhances the efficiency and user-friendliness of the platform, contributing to a streamlined and comprehensive learning experience.

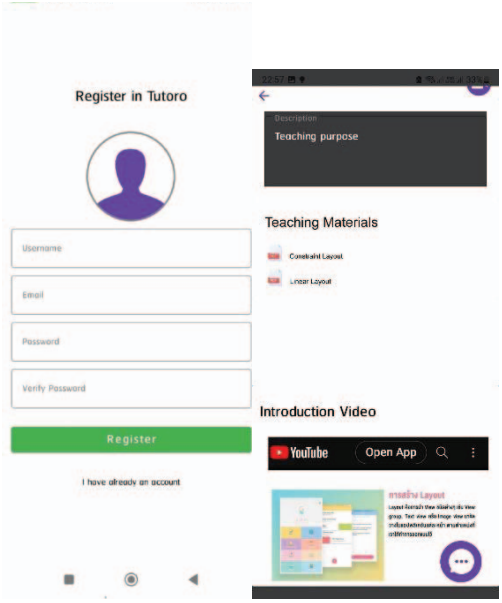

Fig. 2 Registration screen and a list of teaching material

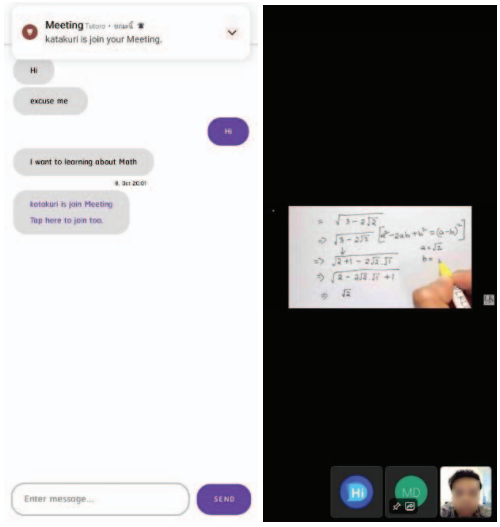

Fig. 3 Private chat message and screen sharing via video conference feature

Table 1 shows the mean score for all six factors is above 4.30, which indicates that the product or service is generally well-received by users. The standard deviation for all six factors is relatively low, which indicates that the users' ratings are fairly consistent. The factor with the highest mean score is satisfaction (4.53), which indicates that users are generally satisfied with the product or service. The factor with the lowest mean score is design (4.30), which indicates that there is some room for improvement in the design of the product or service. Overall, the results suggest that the mobile application is of good quality and is generally well-received by users. However, there is some room for improvement in the design of the mobile application.

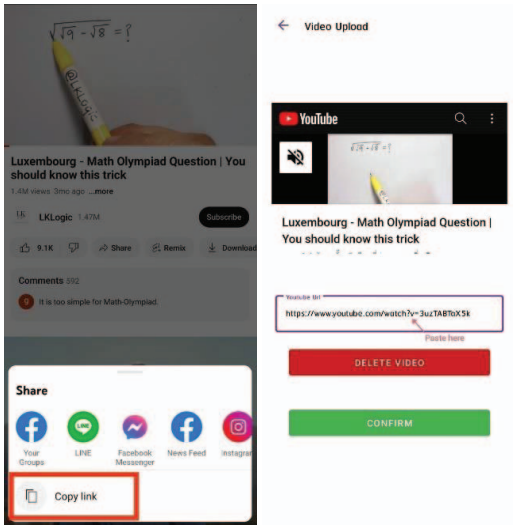

Fig. 4 Youtube link retreival and share for a new video contern post

TABLE I. THE RESULTS OF MOBILE APPLICATION EVALUATION

	$\bar{x}$	SD
1. Design	4.30	0.47
2. Ease of Use	4.47	0.51
3. Engagement	4.33	0.48
4. Personalization	4.50	0.51
5. Collaboration	4.40	0.62
6. Satisfaction	4.53	0.51

V. CONCLUSION

This study concludes by emphasizing the critical role of mobile applications in transforming education. Educators are facing a number of challenges as they navigate this era of educational transformation, including the need to adapt to new technologies and prepare students for the future of work. Therefore, it is essential to acknowledge the potential of M-Learning. This technology offers students increased convenience, flexibility, and personalization, as well as opportunities for innovative and engaging learning experiences. However, to fully realize the potential of M-Learning, it is crucial to address challenges such as internet accessibility and the development of high-quality content. Additionally, the research successfully implemented a mobile application in an academic setting, demonstrating its utility and eliciting positive feedback from students. The application's multifaceted approach, which includes features for both tutors and learners, as well as the seamless integration of resources and communication tools, highlights its potential to enrich the learning experience. The evaluation results confirm the overall positive reception of the mobile application, with users expressing satisfaction. Nevertheless, there remains room for improvement, particularly in terms of design. These findings underscore the importance of ongoing refinement and enhancement in the development of educational mobile applications. Ultimately, this research contributes to the ongoing discourse on the transformative power of technology in education, shedding light on the opportunities and challenges presented by M-Learning and mobile applications.

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REFERENCES

[1] A. T. Korucu and A. Alkan, "Differences between M-Learning (mobile learning) and e-learning, basic terminology and usage of M-Learning in education," Procedia Social and Behavioral Sciences, vol. 15, 2011, pp. 1925-1930.

[2] K. M. Jaber, M. Abduljawad, A. Ahmad, M. Abdallah, M. Salah, and N. Alhindawi, "E-learning mobile application evaluation: Al-Zaytoonah university as a case study," Journal of Advances in Soft Computing and its Applications, vol. 13(3), 2021, pp. 88-99.

[3] S. Criollo-C, E. Altamirano-Suarez , L. Jaramillo-Villacís, K. Vidal-Pacheco, A. Guerrero-Arias, and S. Luján-Mora, "Sustainable teaching and learning through a mobile application: A case study," Sustainability, vol. 14(6663), 2022, pp.1-17.

[4] A. Hinze, N. Vanderschantz, C. Timpany, S.J. Cunningham, S.-J. Saravani, and C. Wilkinson, "A study of mobile app use for teaching and research in higher education," Technology, Knowledge and Learning, vol. 28, 2023, pp. 1271–1299.

[5] M. Sarrab, L. Elgamel, and H. Aldabbas, "Mobile learning (M-Learning) and educational environments," International Journal of Distributed and Parallel Systems, vol. 3, 2012, no. 4, pp. 31-42.

[6] K. Peters, "M-Learning: Positioning educators for a mobile, connected future," International Review of Research in Open and Distributed Learning, vol. 8(2), 2007, https://doi.org/10.19173/irrodl.v8i2. 350.

[7] J. T. Norbutayevich, "The use of mobile learning applications in higher education institutes," Advances in Mobile Learning Educational Research, 3(1), 2023, pp. 610-620.

[8] Y. C. Hsu and Y. H. Ching, "Mobile app design for teaching and learning: Educators' experiences in an online graduate course," International Review of Research in Open and Distributed Learning, 14(4), 2013, pp. 117–139.

[9] A. T. Korucu and A. Alkan, "Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education," Procedia Social and Behavioral Sciences, 15, 2011, pp. 1925–1930.

[10] B. Handal, J. El-Khouryb, C. Campbellc, and M. Cavanaghd, "A framework for categorising mobile applications in mathematics education," Australian Conference on Science and Mathematics Education, 2013, pp. 142-147.

[11] L. Hester, B. R, W. Bohannan, M. Box, M. Wells, and B. O'Neal, "Using an educational mobile application to teach students to take vital signs," Nurse Education Today, 107, 2021, 105154.

[12] K. Demir and E. Akpinar, "The effect of mobile learning applications on students' academic achievement and attitudes toward mobile learning," Malaysian Online Journal of Educational Technology, vol. 6(2), 2018, pp. 46-57,

[13] N.M. Torres and R.A.G. Santos, "Grab a tutor: A decision support mobile app for student tutoring," Journal of Multidisciplinary Research and Development, vol. 1(2), 2022, pp. 1-11.

[14] S.-H. Chung and S.C. Tan, "MENTOR – Intelligent mobile online peer tutoring application for face-to-face and remote peer tutoring," in Proceedings of ASCILITE 2019, Singapore University of Social Sciences, Singapore, 2019, pp. 386-391.

[15] S. Dekhane, X. Xu, and M. Y. Tsoi, "Mobile app development to increase student engagement and problem solving skills," Journal of Information Systems Education, vol. 24(4), 2013, pp. 299-308,

[16] D. M. D. Oliveira, L. Pedro, and C. Santos, "The use of mobile applications in higher education classes: a comparative pilot study of the students' perceptions and real usage," Smart Learning Environments, vol. 8(14), 2021, https://doi.org/10.1186/s40561-021-00159-6

[17] Y. C. Hsu and Y. H. Ching, "Mobile app design for teaching and learning: Educators' experiences in an online graduate course," The International Review of Research in Open and Distributed Learning, vol. 14(4), 2013, pp. 117-139.

[18] A. Hinze, N. Vanderschantz, C. Timpany, S. J. Saravani, and S. J. Cunningham, "Use of mobile apps for teaching and research –

implications for digital literacy," in Proceedings of the International Conference on Asian Digital Libraries (ICADL), 2017, pp. 265-268.

[19] M. Sarrab, L. Elgamel, and H. Aldabbas, "Towards a mobile learning environment: developing an application to support distance learning students," International Journal of Distributed and Parallel Systems, vol. 3(4), 2012, pp. 31-42,

[20] S. Chopvitayakun, "Android Application to Enhance Performance of Internship Program Implementing Cloud Computing Platform and Infrastructure," Procedia - Social and Behavioral Sciences, vol. 197, 2015, pp. 2530-2538.