QAPP: A Mobile Quiz Application for Enhanced Classroom Interaction

Hany Maher Sayed

Department of Mathematics, Faculty of science, Al-Azhar University, Cairo, Egypt

hmsayed@azhar.edu.eg

Hoda Saleh Ahmed

Department of Mathematics, Faculty of science, Al-Azhar University, Cairo, Egypt

hodasaleh.5921@azhar.edu.eg

Abstract

The integration of mobile technology in our daily lives has become increasingly significant. This technology provides students with the freedom to learn anytime and anywhere. Among the various mobile devices available, mobile phones are the most popular choice for students. They are used for a plethora of activities such as browsing the internet and sending emails. The advancement of technology has made mobile learning an enjoyable method of studying for students. Due to its exceptional features, such as accessibility and mobility, many countries have already incorporated it into their educational systems. To enhance the assessment process in high-density classrooms and encourage interactivity between students and teachers, this paper presents a case study on the development of a user-friendly mobile quiz application "QAPP". Our mobile application has been developed with the intention of providing an interactive educational aid for students and instructors capitalizing on the prevalence of mobile devices. A 20-question questionnaire was administered to evaluate the users' responses, indicating that the feedback was positive. Developing mobile applications for mobile learning is crucial to the future of software technology, as it supports learning anytime and anywhere.

1. Introduction

The prevalence of mobile applications is on the rise worldwide [1]. It has become an essential component of people's everyday routines, as everyone endeavors to keep up with the latest technological advancements that make life more convenient and effortless [2]. The advancement of technology has significantly improved the capabilities of mobile devices. The latest generation of mobile devices, smartphones, can now perform tasks that were previously restricted to computers. They can be utilized for various functions beyond making calls and sending messages, including email, data searches, financial transactions, education, and much more. The rapid progress of the Internet and mobile devices has altered the habits of the population and led to the development of mobile applications (apps) that support their daily activities. A software application that is specifically created to function on a mobile device, such as a watch, tablet, or phone, is commonly referred to as a mobile application [3]. The distinguishing features of mobile devices include their portability, widespread availability, and ease of use. Due to these features, many countries around the world have begun implementing mobile devices in education [4,5]. The importance of mobile applications has rapidly increased, as they can be utilized for various purposes, including education. The rapid evolution of technology has had a significant impact on education and has led to the emergence of mobile learning as a crucial aspect of the educational process [6,7]. When discussing education, it is essential to consider the type of technology that will support it. The use of mobile devices as a learning tool can support remote learning programs and provide access to learning content anytime and anywhere [8,9]. Therefore, the advent of mobile devices has had a positive impact on education, leading to the emergence of mobile learning as a potential component of the educational system.

The process of utilizing mobile applications on mobile devices during the educational process is known as mobile learning [10]. Mobile devices are portable electronic devices that include computing devices such as personal digital assistants, smartphones, and handheld devices. Mobile learning applications are software products that can be obtained by students from various sources, including the website of their educational institution. Developing mobile applications for mobile learning is crucial to the future of software technology, as it supports learning anytime and anywhere. In our paper we aim to take advantage of advancements in mobile technology to encourage our students to make the most of these devices. To simplify the assessment process in high-density classrooms and improve interaction between teachers and students, we have created an innovative quiz mobile application called "QAPP".

Our proposed quiz mobile application aims to be a user friendly, simple, and interactive application that we are going to detail in this study. Our primary focus is to ensure that the content within the application is easily understandable, meaningful, and attractive to the learners. The rest of this paper is structured as follows: Section 2 describes the related work. Section 3 demonstrates the scientific structure of the mobile-quiz application. Section 4 shows a case study for implementing "QAPP" in a particular community. The results and the observations are presented in Section 5. Finally, Section 6 concludes the study and provides directions for future work. In conclusion, this paper provides an in-depth exploration of our proposed quiz mobile application. We emphasize its user-friendly and interactive nature, as well as the importance of creating understandable, meaningful, and attractive content for learners. By structuring the paper as described above, we aim to provide a comprehensive understanding of our research, methodology, implementation, and future directions.

2. Related Work

Mobile learning (m-learning) refers to the acquisition of knowledge that happens when the learner is not confined to a predetermined location. It also involves making use of mobile

technologies that provide learning opportunities [11]. The use of mobile devices has proven beneficial to learning since they are significantly less expensive than PCs and laptops. As a result, it provides an affordable tool for learning. The academic interest in mobile learning has increased due to the widespread adoption of mobile devices. M-learning also allows students to engage in the learning process at any location, using any device of their choice, and at their convenience [1]. The rise of high-speed wireless internet and the advancement of mobile devices with improved quality and features have greatly contributed to the widespread adoption of m-learning practices. Both learners and educational institutions have shown a growing interest in utilizing mobile technologies in the teaching and learning process, which is reflected in the ever-increasing use of this approach. This trend is indicative of universities' efforts to integrate mobile technologies into their educational practices [12].

Technology has provided us with the ability to transform the way we learn. By creating expansive learning communities and connecting individuals both in person and online, we can now offer the necessary guidance and resources for lifelong education [13]. The concept of Mobile Learning is a progression from traditional e-learning, utilizing the most up-to-date mobile devices such as smartphones, PDAs, cell phones, laptops, and tablet PCs to facilitate computer-aided learning. Numerous approaches to mobile learning have been suggested by scholars. In one study, conventional classroom learning was compared to e-learning and mobile learning [14]. Another one concludes that mobile applications have the potential to revolutionize education by breaking down traditional classroom boundaries [15]. Additionally, [16] stated that a small European Union (EU) state conducted a quantitative study examining the advantages and expenses associated with the utilization of ubiquitous resources, such as tablets for m-learning in educational settings. The analysis of principal components revealed a strong commitment among educators to the adoption of mobile technologies. Furthermore, a stepwise regression analysis indicated that younger teachers were more actively participating in m-learning resources. A method of teaching Chinese chess at a distance using

mobile phones and augmented reality was developed by [17]. Students can learn and play chess without a traditional chessboard by utilizing augmented reality (AR) technology. In [18], a mobile music player application is utilized by students to listen to music and read synchronous lyrics. [19] presents a small-scale study from Greece that provides examples of mobile technology-supported learning activities in science lessons in secondary schools. In [20], a study was conducted to evaluate the effectiveness of using smartphones to teach geography to junior high school students in Taiwan. The results showed that students in the experimental group who utilized the suggested approach to learning were able to learn more effectively with the support of a comprehensive geography learning system. Meanwhile, [21] found that secondary school science students benefited from mobile-based micro-learning and evaluation activities, as they were able to improve their academic performance and motivation. As it stands, smartphones have become the most used device for students accessing educational materials online. [22] have introduced EduMobile which is a user experience model that serves as a mobile application designed for educational purposes aimed at school children. This model can be utilized by mobile application designers who wish to create educational mobile applications for school children by applying user experience (UX) principles which is a collection of essential principles that you can utilize to create designs and experiences tailored to the needs and wants of your users. The development of an educational mobile application called Alphalingo, which facilitates the learning of alphas, has been presented by [23]. This application encourages active and significant learning through the integration of different learning styles, gamification, and spaced learning. The effectiveness of Alphalingo was assessed through a formal experiment and a replication, both of which were conducted with professionals employed at two distinct software companies in Mexico. The work of [24] is focused on the evaluation of usability in an interactive educational application. The aim of this evaluation is to receive constructive feedback and suggestions for the enhancement of the application's design. The application itself has been created specifically to enable direct interaction between students, as well

as between students and teachers, for the purposes of online learning activities.

3. System Architecture

The creation of an application's design and architecture is an integral and crucial stage in the development process, as it greatly impacts the success, effectiveness, and popularity of the final product. Designing educational mobile applications involves a systematic process. This encompasses defining the app's purpose, target audience, and learning objectives, followed by the technical implementation of features, user interface, and functionality. In this section, we will outline the design methodology employed in the development of our mobile application, QAPP. Given the extensive user base of Android smartphones, we have opted to utilize the Android system as our platform for application development. Prior to commencing the programming phase for the application, we present a proposed design plan that serves as a guide.

This plan incorporates a well-thought-out approach aimed at captivating prospective clients effectively. The planning phase is of utmost significance as it encompasses determining the optimal method for user engagement, maximizing performance, and making the most of limited resources.
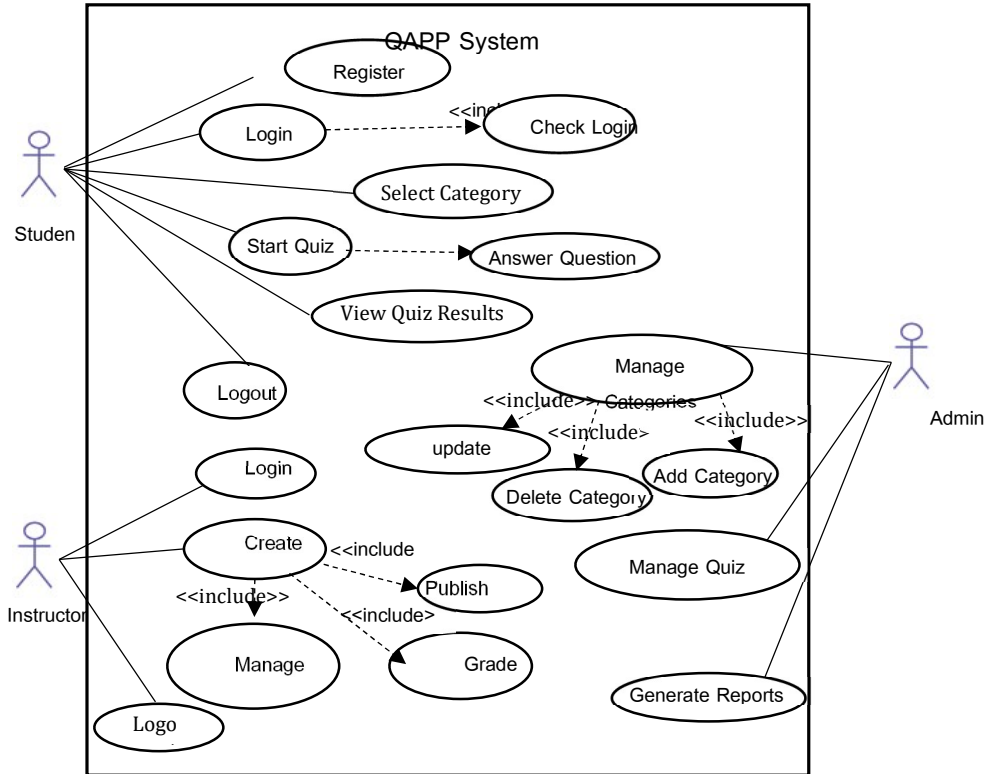
Figure 1: QAPP Use case diagram

The design of QAPP application is based on a use-case diagram, which illustrates the various interactions within the system. This diagram showcases twelve primary use-cases and involves three distinct actors: the administrator, instructor, and student. Each actor represents an external entity that plays a specific role in engaging with the system. This diagram is depicted in figure 1. In unified modeling language use case diagrams, actors are typically depicted as stick figures. The use cases themselves are represented by ellipses, enclosing the name of the use case. The subject of the diagram is depicted as a rectangle that encompasses the use cases. Within the use case diagram, there is a depiction of the interaction between the user and the QAPP Main screen, as well as its core Activities.

The mobile-quiz process for QAPP is illustrated in figure 2 and figure 3 through sequence diagrams. The sequence diagram in figure 2

encompasses three essential components: the Student, who will enroll in a quiz; the Mobile app, which the student will utilize to access the quizzes; and the Server, which will host the database where the instructor will create the quizzes.
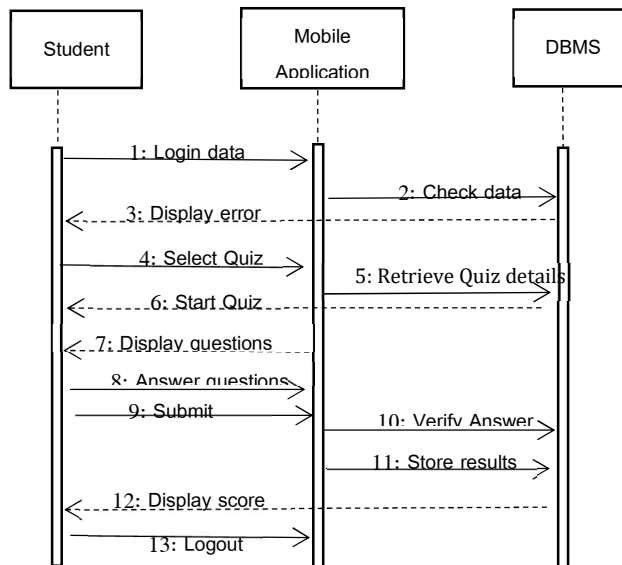

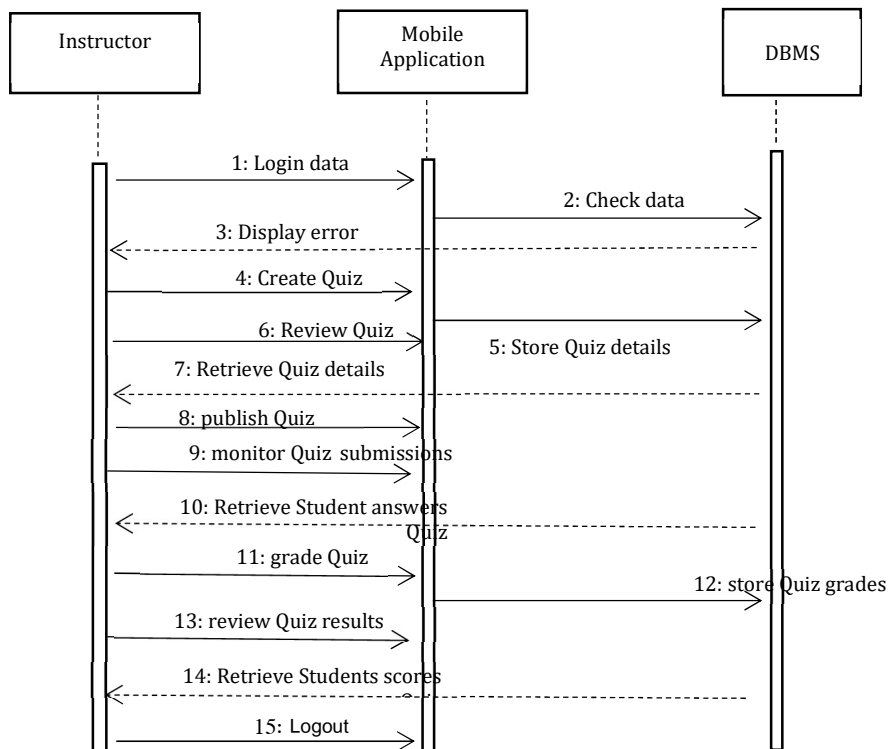**Figure 2: A sequence diagram for the mobile-quiz process QAPP for Student**

Figure 3: A sequence diagram for the mobile-quiz process QAPP for Instructor

The sequence diagram in figure 3 encompasses three essential components: the Instructor, who teaches the course and designs the required quizzes; the Mobile app, which the Instructor will utilize to create the quizzes; and the Server, which will host the database where the instructor will create the quizzes.

4. System Implementation

Our Mobile Application (QAPP) has been equipped with a Graphical User Interface (GUI) that has been developed using the Java Programming Language based on Android Platform. The target quiz was administered to the students of the Mathematics Department at the Faculty of Science, Al Azhar University, located in Cairo, Egypt. The quiz questions were written in the English language, as this is the primary language of instruction within the department.

Figure 4 illustrates the utilization of QAPP mobile application on a cellular device. Our mobile application has been developed with the intention of providing an interactive educational aid for students, capitalizing on the prevalence of mobile devices. Furthermore, this application enables students to engage in simulated experimental tests at their convenience, regardless of location. Upon completion of the quiz, students are provided with feedback regarding their performance. Our objective is to empower students to utilize their mobile phones as educational tools, granting them convenient access to information anytime and anywhere, while also facilitating the learning process through the utilization of a user-friendly application. Additionally, we seek to streamline the assessment process in densely populated classrooms and foster greater interaction between teachers and students. The platform utilized is Android 4.4 (API 20), an open-source software development kit (SDK). This comprehensive kit encompasses a Java virtual machine and Java class libraries that offer fundamental assistance to applications.
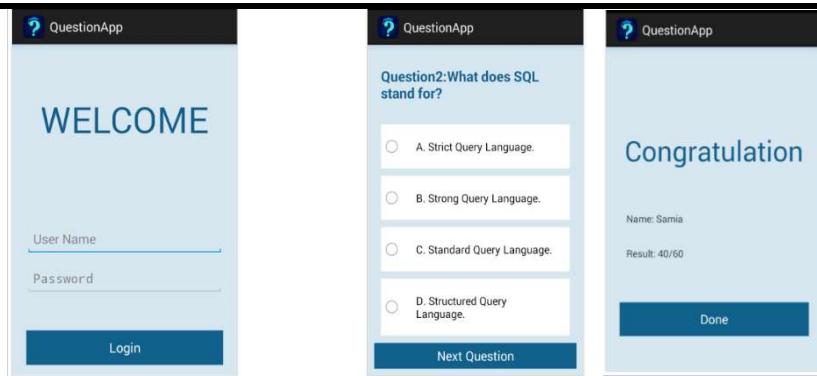
| (4-a) | (4-b) | (4-c) |

Figure 4: Views of QAPP fundamental Activities

QAPP application has a user interface that consists of four main activities for students. The first activity is the login page as illustrated in Figure (4-a), where students can enter their username and password to access the quiz section of their courses. The administrator can also create user accounts for instructors and students and assign them a username and password.

Once logged in, the user can select a specific subject by clicking a button that launches the related activity for the required subject as depicted in Figure (4-b). The app's background color is designed to be comfortable and pleasing to the eye, reducing eye strain, and ghosting in the application. Each page of the app is titled with a description that tells the user the purpose of the current page.

After completing the quiz, the students can get their scores through the fourth activity of the app as shown in Figure (4-c). The user can always return to the home page, and the interface is designed to be intuitive, with font usage, colors, layout, and pictures carefully chosen to attract users.

5. Results and Discussion

A sample of eighty-nine students and seventy-two faculty members from the Al Azhar University, Cairo, Egypt was given a detailed questionnaire to assess the use of QAPP application. The questionnaire had two components: system usability/UI classification

and UI/system learning systems. A 20-question questionnaire was administered to evaluate the users' responses, with 10 questions focused on the usability of the system and 10 questions on the learning system. The questionnaire covered various aspects of our application, including usability, features, and overall user satisfaction. Figure 5 and figure 6 represent some key findings from the survey:
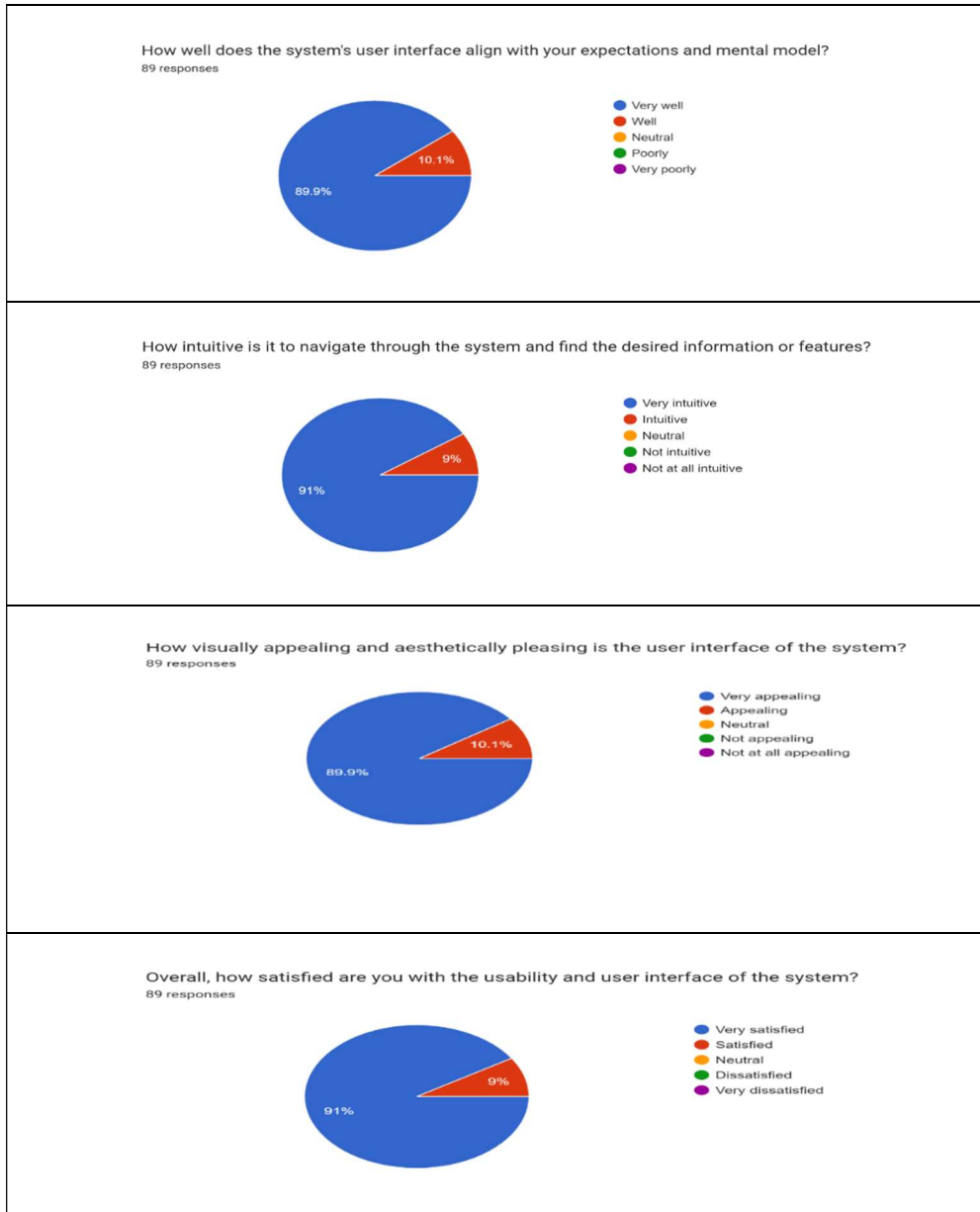

Figure 5: Sample of system usability/UI classification component for Student dimension

The majority of respondents found the application to be user-friendly and intuitive. This feedback reassures us that our efforts to create a seamless user experience are paying off. Also, QAPP features were highly rated for their usefulness and effectiveness in addressing user needs. We are pleased to see that our focus on developing these functionalities has resonated well with our users. The scores related to system usability, user interface, and learning experience questions indicated that the feedback was positive. The comments were favorable, indicating that the students and faculty members found QAPP to be very interesting.
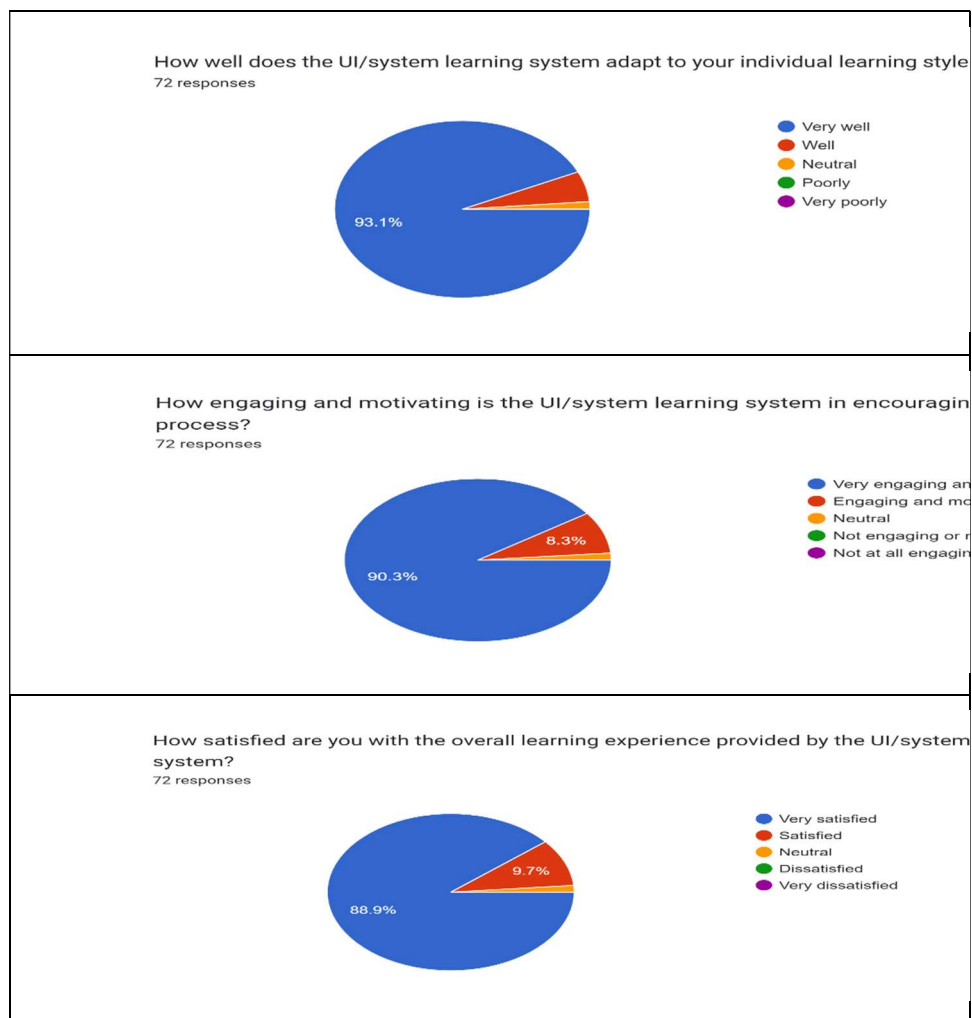

Figure 6: Sample of UI/system learning systems for Instructor dimension

6. Conclusion and Future Work

The latest generation of mobile devices, smartphones, can now perform tasks that were previously restricted to computers. The wide array of functionalities that mobile applications offer has made them an integral aspect of our everyday lives. The process of utilizing mobile applications on mobile devices during the educational process is known as mobile learning. The usage of mobile devices in education significantly impacts key stakeholders. It gives students the opportunity to employ cutting-edge technology, fostering the development of their cognitive and behavioral skills necessary to compete in today's market. It can connect students with a variety of global educational resources, improving their academic status and subsequently enhancing their job prospects. The use of mobile devices also overcomes the time barrier between teachers and students, fostering greater engagement and dialogue.

We provide a user-friendly m-learning quiz application QAPP, designed to be uncomplicated and straightforward. QAPP application has a user-friendly interface that allows students to log in, select a subject, take a quiz, and view their scores. Also, it permits instructors who teach the courses to design the required quizzes. QAPP's design aims to provide an enjoyable and comfortable experience for the user while maintaining functionality and ease of use. In this case study, we focus on multiple choice questions that cater to students' exam preparation needs.

To improve interaction between educators and pupils in high-density classrooms, our application is android based, streamlining the assessment process. Our mobile application has been developed with the intention of providing an interactive educational aid for students and instructors, capitalizing on the prevalence of mobile devices. The target quiz was administered to the students of the Mathematics Department at the Faculty of Science, Al Azhar University, located in Cairo, Egypt. The distinguishing features of mobile devices include their portability, widespread availability, and ease of use. Developing mobile applications for mobile learning is crucial to the future of software

technology, as it supports learning anytime and anywhere. The use of mobile devices as a learning tool can support remote learning programs and provide access to learning content anytime and anywhere.

The future of mobile applications in education will focus on personalized learning experiences, leveraging artificial intelligence, gamification, and immersive technologies like augmented reality and virtual reality to make education more engaging and accessible. These applications will also enhance collaboration, provide real-time feedback, and support lifelong learning while ensuring data privacy and inclusivity.

References

[1] Jones, A. C., Scanlon, E., & Clough, G. (2013). Mobile learning: Two case studies of supporting inquiry learning in informal and semiformal settings. Computers & Education, 61, 21-32.

[2] Abbasi, M., Sarmento, G., Mota, M., Martins, P., Sa, F., & Cardoso, F. (2023, June). Comparing User Experience: An Analysis of Usability Testing Methods for Mobile Applications. In 2023 18th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-10). IEEE.

[3] Hlaváčová, J., Vojtaško, L., Timkovic, M., Tometzová, D., & Kornecká, E. (2020, November). Use of Mobile Applications in Education. In 2020 18th International Conference on Emerging eLearning Technologies and Applications (ICETA) (pp. 136-140). IEEE.

[4] Mohamad, M., Maringe, F., & Woollard, J. (2012). Mobile Learning in Malaysian Schools: Opportunities and Challenges of introducing teaching through mobile phones. International Journal for e-Learning Security, 2(1/2), 133-137.

[5] Serin, O. (2012). Mobile learning perceptions of the prospective teachers (Turkish Republic of Northern Cyprus sampling). Turkish Online Journal of Educational Technology-TOJET, 11(3), 222-233.

[6] Ikhsan, M. A., Santoso, D. A., Ruchiyat, F. F. M., & Ongowarsito, H. (2022, July). Information System Analysis And Design For Mobile-Based Homain Applications. In 2022 1st International Conference on Information System & Information Technology (ICISIT) (pp. 233-237). IEEE.

[7] Kusumaningsih, A., Putro, S. S., Andriana, C., & Angkoso, C. V. (2021, October). User experience measurement on augmented reality mobile application for learning to read using a phonics-based approach. In 2021 IEEE 7th Information Technology International Seminar (ITIS) (pp. 1-6). IEEE.

[8] Velev, D. G. (2014). Challenges and opportunities of cloud-based mobile learning. International Journal of Information and Education Technology, 4(1), 49-53.

[9] Al Hassan, E. I. K. (2015). Mobile learning new technique to contribute the development of distance learning courses, as views from specialists of information and instructional technology in Sudanese universities. Journal of Education and Human Development, 4(1), 269-276.

[10] Parsons, D., & Ryu, H. (2006, April). A framework for assessing the quality of mobile learning. In Proceedings of the international conference for process improvement, research and education (pp. 17-27).

[11] Osman, N. F., & Mohamed, H. H. (2016, October). Islamic pregnancy mobile learning application. In 2016 IEEE Conference on e-Learning, e-management and e-Services (IC3e) (pp. 150-155). IEEE.

[12] Park, S. Y., Nam, M. W., & Cha, S. B. (2012). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. British journal of educational technology, 43(4), 592-605.

[13] Marwan, M. E., Madar, A. R., & Fuad, N. (2013). An overview of mobile applications in learning for student of Kolej Poly-

Tech Mara (KPTM) by using mobile phone. Journal of Asian Scientific Research, 3(6), 527-537.

[14] Aziz, S., Kadel, R., Guruge, D. B., Paudel, K., & Karagiannidis, V. (2021). Mobile learning approaches and its impact on student's education—a survey. International Journal of Information and Education Technology, 11(9), 429-435.

[15] Drigas, A. S., & Angelidakis, P. (2017). Mobile applications within education: An overview of application paradigms in specific categories. International Journal of Interactive Mobile Technologies, 11(4).

[16] Camilleri, M. A., & Camilleri, A. (2017, April). The technology acceptance of mobile applications in education. In 13th International Conference on Mobile Learning (Budapest, April 10th). Proceedings, pp., International Association for Development of the Information Society.

[17] Tsai, Y. S. (2010). Developing a M-learning System for End-Game Strategy and Killing of Chinese Chess Using Mobile Phone AR. Master's Program, Dept. of CSIE, National Chi Nan University, Taiwan.

[18] Chi, C. C., Kuo, C. H., & Lin, K. Y. (2012, March). A design of mobile application for English learning. In 2012 IEEE Seventh International Conference on Wireless, Mobile and Ubiquitous Technology in Education (pp. 238-241). IEEE.

[19] Nikolopoulou, K., & Kousloglou, M. (2019). Mobile learning in science: A study in secondary education in Greece. Creative Education, 10(06), 1271.

[20] Yang, H. C., & Chang, W. C. (2017). Ubiquitous smartphone platform for K-7 students learning geography in Taiwan. Multimedia Tools and Applications, 76, 11651-11668.

[21] Nikou, S. A., & Economides, A. A. (2018). Mobile-Based micro-Learning and Assessment: Impact on learning performance and

motivation of high school students. Journal of Computer Assisted Learning, 34(3), 269-278.

[22] Kaur, K., Kalid, K. S., & Sugathan, S. (2021, July). Exploring children user experience in designing educational mobile application. In 2021 International Conference on Computer & Information Sciences (ICCOINS) (pp. 163-168). IEEE.

[23] Jiménez-Hernández, E. M., Oktaba, H., Díaz-Barriga, F., & Piattini, M. (2021). Using an Educational Mobile Application for Learning the Essence 1.2 Kernel Alphas. IEEE Latin America Transactions, 19(4), 625-633.

[24] Paramartha, A. G. Y., Seputra, K. A., Azima, F., Putra, D. P., Dwi, E., & Aryanto, K. Y. E. (2022, February). Usability Evaluation of an Interactive Educational Mobile Application. In 2022, 24th International Conference on Advanced Communication Technology (ICACT) (pp. 491-495). IEEE.