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Politeknik Tun Syed Nasir Students Perception On Chemistry Education Application

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ABSTRACT

The continuous transformation to digital education, particularly in the context of online learning, is tightly linked to the development of innovative materials. Interactive learning is a valuable supplementary approach to enhancing educational outcomes and promoting student engagement in the continuously shifting educational environment. This innovation is called JTKM-Chemistry Education Apps 2.0 which covers courses on the subject Fundamental of Chemistry. The primary goal of this study is to evaluate the degree to which this application can provide students with benefits. This interactive educational application was created via MIT App Inventor and is suitable for smartphones and tablets. This interactive learning application integrates tools from iSpring Suite, Sparkol VideoScribe, PowToon, Microsoft Sway and Forms, YouTube, Quizizz, and PDF files to provide engaging educational content. A survey question consisting of 10 questions that evaluated the percentage of student feedback for the Android app was completed by 61 students who used this application. The survey results indicated that 70% of students evaluated the developed application as user-friendly, 71% believed that it was easy to learn, and 78% expressed that it enhanced their comprehension of the subject. Furthermore, 80% recognized mobile device accessibility, while 77% valued the flexibility to update content. While only 35% rated online learning as more engaging than traditional classroom instruction, 71% believed that interactive materials enhanced their motivation to learn. This study shows that mobile-based interactive learning can significantly enhance student engagement and learning in online environments. Future studies should investigate long-term impacts on educational outcomes across different subject areas and student demographics.

1.0 Introduction

Traditionalists believe that the process of learning occurs when informative instruction and receptive learning are combined. The lecturer delivers educational material, which the learner

receives, processes, and then stores in their memory. During examinations, the learner retrieves the stored information from memory when prompted. In response to the current educational landscape, conventional learning methodologies have undergone substantial modifications. In the context of the Fourth Industrial Revolution, online learning has emerged as a critical component in the evolving landscape of education. In contemporary times, the acquisition and assimilation of information necessitate a novel style of learning that entails active engagement from learners. These active learners possess the capacity to independently begin, strategize, execute, monitor, assess, and apply their learning activities (Aisyah et al., 2021).

Blended learning is one of the most present educational strategies in the higher education system of the 21st century. According to UNESCO guidelines, blended learning offers students flexibility and support by combining both traditional and digital methods (Samoylenko et al., 2022). Blended learning encompasses the integration of diverse technological tools and instructional approaches, necessitating thoughtful deliberation to enhance student learning outcomes (Rasheed et al., 2020). According to Abidin et al. (2020), the process of learning can occur both within the confines of a classroom setting as well as outside of it. Conversely, outside the classroom, students engage in self-directed learning, which can occur at any time and in any location after the formal instructional period.

A literature study indicates that several studies have investigated the use of mobile technology in blended learning environments. Table 1 summarizes recent studies focusing on the integration of mobile applications in blended learning contexts across several disciplines. Booton et al. (2023) studied 152 commercially available Android applications in the fields of visual arts, personal development, and socio-emotional activities, demonstrating that app store ratings were inconsistent indicators of creative quality, but applications marketed to older children generally received higher creativity scores. Xayriniso, (2023) discovered that the integration of interactive whiteboards, cellphones, and educational applications markedly enhanced the quality and efficacy of English language training. Irudayasamy et al. (2021) indicated that mobile applications utilized in Mobile Assisted Language Teaching (MALT) empowered educators to efficiently provide English lessons both in and outside the classroom. In the realm of lifelong learning, Nor et al. (2022) created tailored mobile applications for short-term courses and noted promising outcomes, indicating the apps' preparedness for wider public implementation. Deris & Nazir, (2019) examined the utilization of mobile applications on Surah Lazim and Hukum Tajwid in Islamic education, concluding that user satisfaction significantly influences perceptions of benefit, ease of use, attitudes, and behavior goals regarding ongoing application usage.

Table 1: Recent Studies on the Use of Mobile Applications in Blended Learning

Author	Application Used	Subject Area	Key Findings
(Booton et al., 2023)	152 commercially available android apps.	Visual arts, personal development and social emotional activities.	App store indicators did not reliably predict the creative quality of the apps. Apps designed for older children tended to receive higher creativity scores.
(Xayriniso, 2023)	Interactive whiteboards (IWB), smartphones and educational apps.	English language learning and teaching.	The use of modern technologies significantly enhances the quality and effectiveness of english language education.
(Irudayasamy et al., 2021)	Various mobile applications used in Mobile-Assisted Language Teaching (MALT)	English language teaching and learning.	Teachers effectively use mobile apps for both in class and out class english instruction.
(Nor et al. 2022)	A custom mobile app developed.	Lifelong education on short-term courses.	Showed positive results, indicating that the app is ready for public deployment.
(Nazir & Deris, 2019)	Surah Lazim and Hukum Tajwid Mobile App.	Islamic education specifically in learning Al-Quran and Tajwid.	User satisfaction significantly influences perceived usefulness, ease of use, attitude, and behavioral intention to use the app.

Students can demonstrate self-motivation by expanding their education through the efficient use of current mobile technologies, which offer improved options for independent and interactive learning experiences. Android applications are a viable tool for facilitating online interactive learning through the use of smartphones. According to Mayer, (2020), mobile technology has significant promise as a tool to facilitate academic learning in many locations and at any given moment. The integration of technology in the education and skill sector is becoming more prevalent as the digital realm is progressively employed to impart education, information, and skills through novel and inventive methods.

The Institute of Higher Learning has recommended that researchers and lecturers take on the responsibility of guiding innovation and comprehending the various variables associated with implementing the framework, as well as facilitating the advancement of digital technology (Cook et al., 2023). The incorporation of mobile apps for learning is necessary to enhance teaching and learning activities, hence empowering learners. Jurkovič, (2019) reported a major rise in mobile device usage, especially smartphones, motivated by various objectives such as academic activities, retrieving data, social engagement, and recreational activities. Online learning is a significant catalyst in enhancing educational accessibility, training opportunities and the comprehensive standard of education.

Researchers frequently use quantitative approaches to evaluate responses from participants when analyzing user experiences of a mobile learning application. A wide method involves utilizing structured feedback forms, wherein participants evaluate their satisfaction with particular claims through a numerical scale (Nazir & Deris, 2019). Responses are generally analyzed by descriptive statistics, with mean values computed to summarize the overall pattern in the data. The path interpretation scale in Table 2 demonstrates that mean values from 0.00 to 1.66 signify low agreement, 1.67 to 3.33 denote moderate agreement, and 3.34 to 5.00 represent excellent agreement (Abidin et al., 2020). This methodological technique has been extensively employed in prior research to offer a coherent and systematic comprehension of user input within the realm of educational technology.

Table 2: Interpretation scale mean

Mean Value	Interpretation Level Mean
0.00 – 1.66	Low Level
1.67 – 3.33	Moderate Level
3.34 – 5.00	High Level

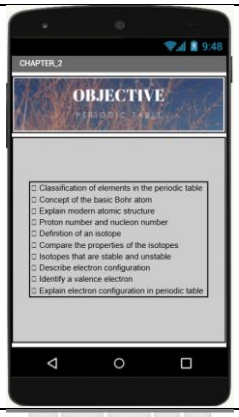
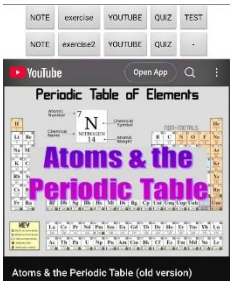
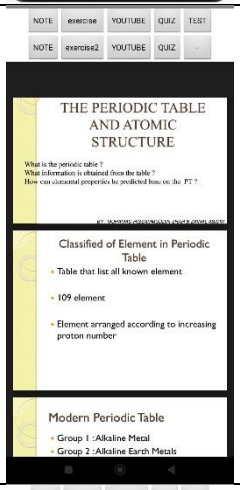
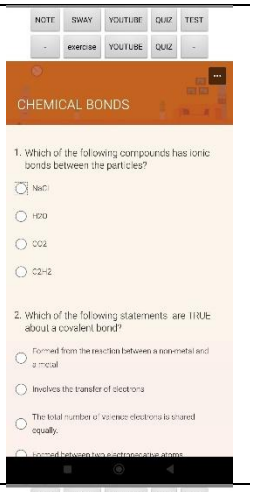
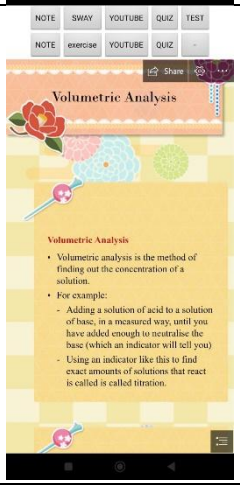
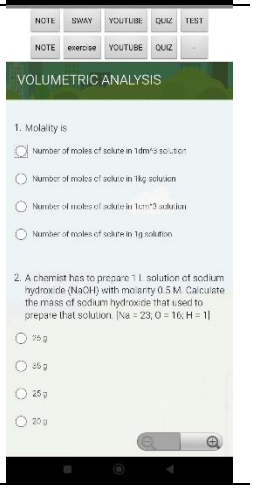
Modern technologies are widely employed to improve teaching and learning by incorporating digital tools such as computers, tablets and smartphones into educational contexts. Thus, allowing continuous 24/7 learning opportunities that are associated with 21st-century education (Xayriniso, 2023). Mobile apps learning has the potential to significantly facilitate the learning process for students, particularly within the higher education system. Students can engage in repeated study of a subject without any constraints linked to a particular time or place. The primary goal of this study is to evaluate the degree to which this application can provide students with benefits. Learner are liable for their educational progression and are expected to participate actively and independently in the educational process.

2.0 Methodology

This study aimed to evaluate the usability of the JTKM-Chemistry Education Apps 2.0 among students enrolled in the courses for the subject Fundamental of Chemistry at Politeknik Tun Syed Nasir Syed Ismail. A total of 61 students participated in the study, selected on a voluntary basis. Data were collected using a structured questionnaire and analyzed using IBM SPSS Statistics software, version 26. The questionnaire employed a five-point Likert scale to measure user perceptions of the application's usability, with response options ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The content of the JTKM-Chemistry Education Apps 2.0 was developed using a combination of software tools and digital resources, including iSpring Suite, Sparkol VideoScribe, PowToon, Microsoft Sway and Forms (Office 365), YouTube, Quizizz, and PDF-format notes. The app's android-based platform allows for periodic content updates to ensure relevancy and engagement. Table 3 provides an overview of the apps content features, which are designed to support diverse learning activities such as video-based instruction, downloadable notes, interactive quizzes, and formative assessments.

Table 3: Overview of Android App Content

Topic	Details	Visuals	Topic	Details	Visuals
Objective	Clearly states the learning outcomes expected by the end of each chapter		Youtube	Provides access to educational videos for enhanced visual learning	
Note	Specific notes available for download in PDF format		Quiz	Integrates Quizizz for fun and engaging student-paced formative assessments	
Sway	Uses Microsoft Sway to create interactive presentations, newsletters, and documents		Test	Utilizes Microsoft Forms to design tests with deadline settings, respondent tracking, and answer feedback	

3.0 Discussion of analysis and findings

The results of this study are based on student evaluations regarding the usability and efficacy of the JTKM-Chemistry Education Apps 2.0. The feedback was gathered through a standardized questionnaire consisting of ten items aimed at assessing different aspects of the study. Descriptive analysis was used to evaluate the data, which are displayed in Tables 4 and 5.

Table 4 shows that student responses generally reflect positive evaluations of the usability of mobile applications. Regarding the statement "The mobile application is user-friendly," 59% of respondents showed agreement, 11% indicated strong agreement, and merely 5% disagreed. In relation to the statement "Users can operate this application without assistance," 48% agree and 11% strongly agree, indicating that the majority considered the app to be understandable and user-friendly. Regarding responsiveness, 61% of students agree and 13% strongly agree with the statement "The application delivers information promptly," so affirming the app's efficacy in content delivery.

The findings indicate that students viewed the application as easy to learn (61% agree, 10% strongly agree), offered flexible access for updating sub-topics (66% agree, 11% strongly agree), and allowed for exit at any moment (61% agree, 23% strongly agree). These attributes highlight effective usability principles for mobile apps including user control and freedom, consistency, and adaptability (Nazir & Deris, 2019).

Furthermore, the app's interactive functionalities seemed to improve student involvement and understanding. Regarding the statement "Using these interactive learning materials helped me gain a deeper understanding of the subject" 62% of students agree, while 16% strongly agree. In the same direction, 64% agree and 16% agree that "Interactive learning is more accessible due to its availability on smartphones or tablets." These findings corroborate prior research highlighting the significance of mobile application in enhancing learner for the long life learning (Nor Hanita et al., 2022).

In addition, the application's interactive functionalities seemed to improve student involvement and understanding. Regarding the statement "Using these interactive learning materials helped me gain a deeper understanding of the subject," 62% of students expressed agreement, while 16% indicated strong agreement. In a comparable way, 64% agreed and 16% agreed that "Interactive learning is more accessible due to its availability on smartphones or tablets." These findings corroborate prior research highlighting the interactive learning system of mobile technologies for independent study of interface design in android applications (Syaifudin et al., 2023).

However, answers were more mixed on the statement "Online learning is more engaging than classroom learning", with only 28% agreed and 7% strongly agreeing, while 38% stayed neutral and 28% disagreeing or strongly disagreed. This shows that while students value mobile learning tools, many still believe instructor interaction is more engaging. This is consistent with studies highlighting the limitations of online learning in recreating classroom dynamics (Panigrahi et al., 2018).

In the last question, 61% agreed and 10% agreed that "These interactive materials really get me excited to learn". These findings support previous research emphasizing the motivational potential of interactive digital learning aids in promoting student engagement (Aisyah et al., 2021). Motivation significantly impacts learners' willingness to engage in and remain with online learning, with characteristics such as easy use, enjoyment, and material relevance playing essential roles (Aisyah et al., 2021). These characteristics help explain the excellent student response to the JTKM-Chemistry Education Apps 2.0 since effective digital tools frequently fit with basic driving motivations.

Table 4: Student Feedback Percentage for Android Apps

Item	Question	Number of Student (Percentage)				
		Strong Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strong Agree
1	The mobile application is user-friendly	0 (0)	3 (5)	15 (25)	36 (59)	7 (11)
2	Users can operate this application without assistance	0 (0)	4 (7)	21 (34)	29 (48)	7 (11)
3	The application delivers information promptly	0 (0)	0 (0)	16 (26)	37 (61)	8 (13)
4	This application is easy to learn	0 (0)	3 (5)	15 (25)	37 (61)	6 (10)
5	Users have the flexibility to update sub-topics whenever they wish	0 (0)	1 (2)	13 (21)	40 (66)	7 (11)
6	Users can exit the application at any time	0 (0)	0 (0)	10 (16)	37 (61)	14 (23)
7	Using these interactive learning materials helped me gain a deeper understanding of the subject	0 (0)	1 (2)	12 (20)	38 (62)	10 (16)
8	Interactive learning is easier because it can be accessed through a smartphone or tablet	0 (0)	1 (2)	11 (18)	39 (64)	10 (16)
9	Online learning is more engaging than classroom learning	6 (10)	11 (18)	23 (38)	17 (28)	4 (7)
10	These interactive materials really get me excited to learn	0 (0)	1 (2)	17 (28)	37 (61)	6 (10)

Table 5 shows that the average scores for items Q1 to Q10 reflect generally acceptable views by students of the JTKM-Chemistry Education Apps 2.0. On all items, except for Q9, the mean values were above 3.33, indicating a high degree of agreement among the participants. Item Q9, which evaluated whether " Online learning is more engaging than classroom learning" resulting a mean score of 3.10±1.060, which falls within the moderate range. However, the mean still exceeds the minimum criteria for moderate agreement (Mean>1.67), suggesting that students were not entirely negative of the statement. The findings point out that students are more motivated when mobile applications include interactive, visually appealing, and user-friendly elements that improve their learning experience. Prior research has highlighted the significance of usability and visual appeal in educational technologies to maintain learner motivation, and the application design's simplicity, creativity, and interactivity appear to encourage participation and reduce feelings of boredom (Sim et al., 2020).

Table 5: Average Student Evaluation of Android Apps

Item	Question	Mean
Q1	The mobile application is user-friendly	3.70±0.782
Q2	Users can operate this application without assistance	3.64±0.775
Q3	The application delivers information promptly	3.87±0.618
Q4	This application is easy to learn	3.72±0.686
Q5	Users have the flexibility to update sub-topics whenever they wish	3.84±0.610
Q6	Users can exit the application at any time	4.07±0.629
Q7	Using these interactive learning materials helped me gain a deeper understanding of the subject	3.93±0.655
Q8	Interactive learning is easier because it can be accessed through a smartphone or tablet	3.95±0.644
Q9	Online learning is more engaging than classroom learning	3.10±1.060
Q10	These interactive materials really get me excited to learn	3.79±0.635

Lecturers of chemistry courses can proficiently include this application as a supplementary educational resource that improves the teaching and learning experience. This app's significant benefit is in its thorough conformity with the comprehensive course syllabus, integrating various instructional components, including quizzes, assessments, and animated interactive lectures (Asmara et al., 2024). The visually appealing layout facilitates diverse methods of learning and promotes active participation (Syaifudin et al., 2023). In addition, lecturers can continually update

the app content, ensuring its relevance and adaptability to educational requirements. The accessibility of smartphones and tablets enables students to participate in flexible, mobile learning, hence broadening educational opportunities beyond the traditional classroom environment (Abidin et al., 2020; Isrokatun et al., 2023). Mobile-based learning solutions have demonstrated the ability to enhance pupil independence and academic achievement by offering continuous and environmentally rich access to educational content. The potential of the app to improve both teaching and learning outcomes in mobile-enabled education and to encourage regular usage is highlighted by these findings.

4.0 Conclusion and future research

The JTKM-Chemistry Education Apps 2.0 showed the potential to be a useful additional tool for chemistry education, as displayed by the high levels of student satisfaction it has received in important usability and content delivery parameters. The app's effectiveness in satisfying the educational needs of learners is indicated by the substantial consistency on the majority of evaluation criteria, which highlights the high level of student engagement and interest in the application. The combination of a variety of media formats, including interactive forms, PDF notes, quizzes, and animated videos, promotes a more specific and engaging learning experience and supports a variety of learning styles. It is crucial to note that the app's content is in alignment with the current curriculum, turning it a practical assist for lecturers instructing the Fundamentals of Chemistry course. Students are able to participate in continuous learning beyond the classroom due to its adaptability, which includes regular content updates and accessibility via smartphones and tablets. These results show the app's ability to improve both teaching and learning outcomes and encourage sustained usage in mobile-supported education. Future studies should investigate long-term impacts on educational outcomes across different subject areas and student demographics.

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Author Contributions

Razli, M.H: Conceptualization, Methodology, Software, Writing Original Draft Preparation; **Abidin, M. H. S. Z.:** Conceptualization, Methodology, Software, Writing Original Draft Preparation**; Yahaya, M. H.:** Conceptualization, Methodology, Software, Writing Original Draft Preparation; **A.K. Khamis**: Data Curation, Validation, Supervision; **O. Phewnil**: Data Curation, Validation.

Conflicts of Interest

The manuscript has not been published elsewhere and is not being considered by other journals. All authors have approved the review, agree with its Submission and declare no conflict of interest in the manuscript.

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