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Development of an Android Mobile Application to Support e-Learning in Data Communication & Networking Course

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Abstract: *The development of the current information and communication technology (ICT) system has effectively modernized several Malaysian sectors, including the social, political, and economic spheres. The Industrial Revolution (IR 4.0) and the Internet of Things (IoT) are two new concepts and paradigms that have been spurred by the growth of ICT and will undoubtedly help advance human civilization and the nation. The same is true for schooling. The integration of ICT technology into the teaching and learning process is necessary because of issues that arise during the process, such as student attitude and time constraints. Lecturers utilize the extremely limited time allotted for teaching and learning to complete the syllabus. DataComm.Net Apps is an Android smartphone app designed to let students in Mukah Polytechnic's Department of Electrical Engineering access course materials for Data Communication & Networking. The purpose of this study was to produce instructional materials for Thunkable Android applications that could be utilized in Data Communication & Networking courses at the Electrical Engineering Department of Mukah Polytechnic. This application was designed and developed online utilizing Thunkable software, which has a few features, including course information notes, practical works, exercise, video, and a Google Link. According to the results of its use, this application can improve the teaching and learning process, save time for lecturers, decrease the need for printed notes, and encourage students to master the Data Communication & Networking course.*

Keywords: DataComm.Net Apps, Thunkable, Data Communication & Networking

1. Introduction

Applications for teaching and learning have grown in popularity because they improve accessibility, engagement, and interactivity in the classroom. The use of technology that can be integrated into mobile learning is one of the many ways that innovative teaching materials may be created (Cahyo et al., 2024). Almost every student uses a mobile device for learning these days. Students' perspectives on electronic devices are changing; they no longer view them as tools for communication or as gaming and music consumption devices (Daineko et al., 2022). In educational innovation, the use of teaching materials is intended to enhance students' learning competence (Li et al., 2020), make learning enjoyable and easily embraced (Awang et al., 2022), maximize students' capacity for creative thought (Widyaningrum et al., 2022), and provide a solution to learning issues (Suryani et al., 2022).To design and create a unique procedure for the course that will be utilized electronically, mobile applications for teaching and learning have been developed utilizing Thunkable. The readily available and user-friendly

Thunkable program enables educators to produce new and creative learning materials that can pique students' interest and passion for studying at home and in the classroom (Rodhotun et al., 2024). According to Rahmatullah and Purwanti (2021), students' learning interests are greatly increased when they use Android-based apps like Thunkable. Graceillia and Setiana (2021) discovered that Thunkable apps function flawlessly and aid learners in comprehending the course content. As a result, mobile learning materials with an Android platform are among the best options for raising the standard of instruction in the classroom. In addition, they may be used to establish an interactive learning environment and students' participation in subsequent learning activities can be increased in an interactive learning environment (Krismon & Wahyu, 2024).

The aim of this research was to provide educational materials for Android-based thunkable applications that may be used in Data Communication & Networking classes at Mukah Polytechnic's Electrical Engineering Department. Figure 1. Shown the Display layout - features buttons for the thunkable app's android application and notes display.

Problem Statement

Issues that arise throughout the teaching and learning process, such as time constraints and student attitudes, make it more and more imperative to use ICT technology into the process. The time allotted for teaching and learning is typically extremely constrained, and lecturers utilize it entirely to complete the course.

Due to their limited time, lecturers find it challenging to meet each student's unique skill level and offer coaching based on their needs. Traditional teaching approaches frequently fail to adequately depict abstract natural processes, and boring instruction might cause students' attention to wane (Maya et al., 2024). Students may get disinterested in certain courses as a result, particularly those that emphasize "hands-on" learning. If educators only employ lecture methods, students may soon lose interest in learning and feel tired, disinterested, and unfocused from illustrations (Yanti & Aprianif, 2023).

The time allotted for teaching and learning is typically extremely constrained, and lecturers utilize it entirely to complete the course. Due to their limited time, lecturers find it challenging to meet each student's unique skill level and offer coaching based on their needs. Students may get disinterested in certain courses as a result, particularly those that emphasize "hands-on" learning. Although e-learning programs offer a multitude of chances to individuals with diverse expectations and characteristics who wish to utilize educational prospects, it should not be overlooked that they also have certain restrictions (Ebru & Mustafa, 2013). To solve these problems, it becomes essential to employ creative and captivating educational media, which can stimulate new interests and wants while increasing motivation for learning (Magdalena et al., 2021). The use of ICT technology in the teaching and learning process, management, and education administration is necessary since it can make information resources conveniently accessible at any time and from any location. Additionally, Khotimah et al. (2023) found that educational media applications that include local knowledge and include graphics, videos, and simulations can improve students' learning attention even though they need an internet connection.

Application Development Methodology

Designing an instructional system is a crucial step in the difficulty of creating a training or educational product using technological components. Therefore, in any interactive mobile learning creation, like DataComm.Net Apps, the design planning of Android application

development is crucial. In addition, the creation of mobile learning applications for Android that rely on instructional videos necessitates a high-quality interface that is simple to use. This will pique students' curiosity about what the application has to offer. Thus, layout selection, button functionality, video simulation, graphics, and communication linkages are the five primary components that are considered during the interface design phase. Figure 2 displays the arrangement. Exercise displays and practical works.

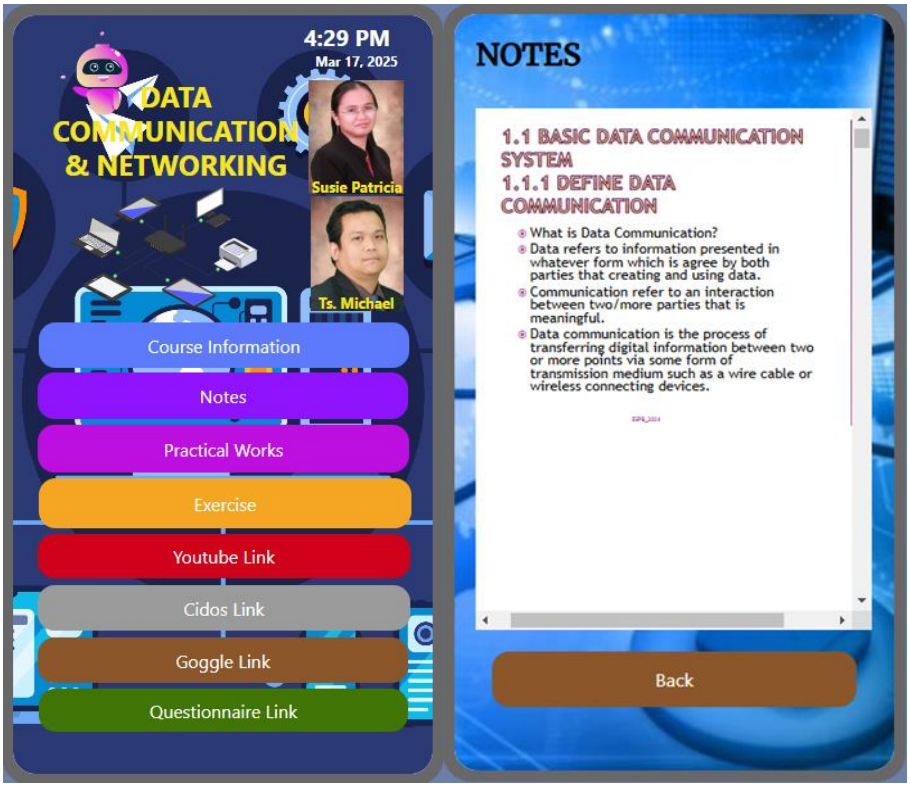

Figure 1: Display layout - features buttons and notes display.

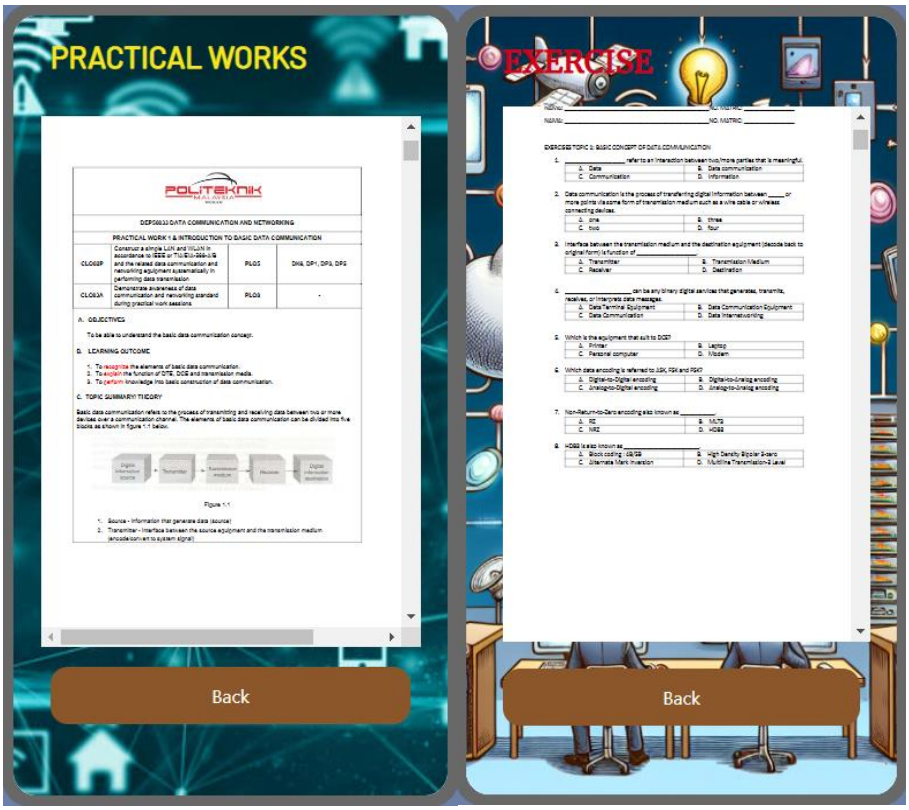

Figure 2: Practical work and exercise display.

Application Development Impacts

Table 1: Application Development Impacts

No	Impacts	Explanation
1.	**Supporting the Process of Teaching and Learning**	This DataComm.Net Apps Android application can help students learn the Data Communication & Networking course more effectively.
2.	**Saving Lecturer Time**	This DataComm.Net Apps Android app can be used to replace extra lectures for students' self-study as well as to maximize lecture time for lecturers. By doing this, the strain of the lecturer's lack of time to finish the syllabus can be avoided.
3.	**Savings on Printing**	Using this DataComm.Net Apps Android app can help students learn more effectively by using less paper for printed materials. Students and educational institutions benefit from this by saving money and time on printing notes and reference materials.
4.	**Encouragement for Students**	With the help of the DataComm.Net Apps Android app, students can be inspired to learn technical skills. Mobile learning allows them to efficiently access lab sheets, work tasks, instructional videos, and notes. As a result, they will understand every lecture's material and be prepared to learn more in the one that follows.

2. Methodology

Questionnaire Study on Application Effectiveness

A quantitative approach was used to measure and analyze the numerical data to determine the relationship between variables, in accordance with the goals of the study. A Google Form was used to collect data, and students were asked to score how much they agreed with each statement on a 5-point Likert scale. A questionnaire from the program's users, or students, is also required to assess how well the DataComm.Net Apps application facilitates students'

understanding of this course. Therefore, to get feedback and recommendations from students for enhancements to the DataComm.Net Apps program, a questionnaire was used to assess how effective utilizing the application was. The questionnaire study's chosen respondents were students enrolled in the Electronic Engineering Diploma (Communication) program at Mukah Polytechnic who took the Data Communication & Networking course. Each section contains a few items, and the responses are classified using the Likert scale method 1 (strongly disagree), 2 (disagree), 3 (almost agree), 4 (agree) to 5 (strongly agree). The findings of this study are presented in the form of tables and line charts and analyzed based on the mean score.

3. Result and Discussion

Analysis of Part A: Learning Strategies (Contents)

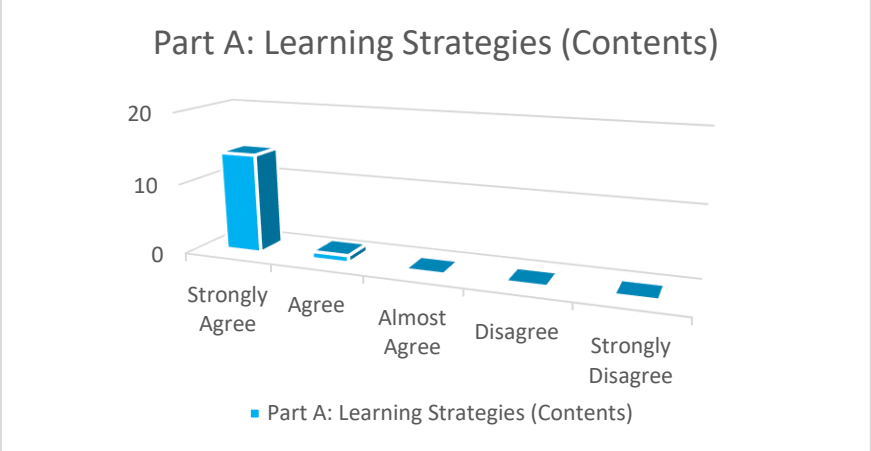

Figure 3: Learning Strategies (Contents) Analysis

The purpose of Part A analysis is to evaluate how well the learning mechanisms used in the DataComm.Net application work. The application's instructional content, which includes the Data Communication and Networking course syllabus, notes, lab sheets, and review tasks, is evaluated by looking at how well students grasp it. Only one (7%) respondent indicated that they agreed, while 14 (93%) indicated that they strongly agreed.

Analysis Part B: Media and Technical Suitability (Attraction)

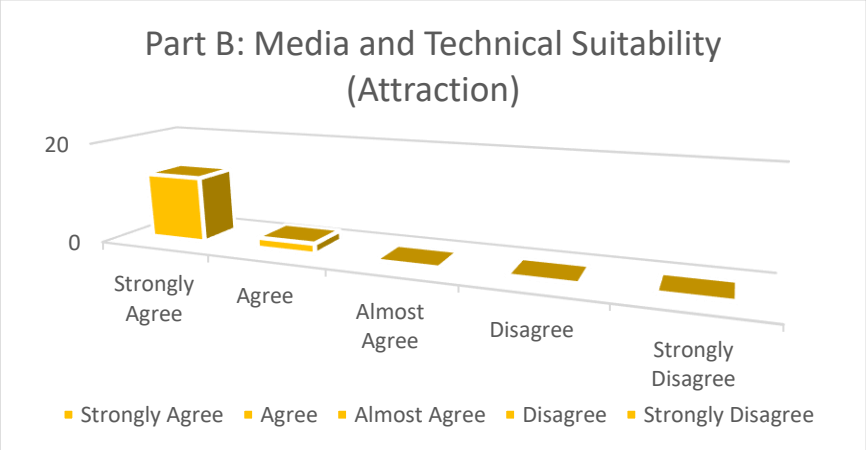

Figure 4: Media and Technical Suitability (Attraction) Analysis

Part B's analysis data is used to evaluate how well the technical and media components of the DataComm.Net application work. It is examined considering how appealing the application's layout, button functionality, colour schemes, and text usage are to users. This is to guarantee that the visual display of this program will always entice students to use it without getting bored. Part B has eight question items that have been introduced. 2 (13%) respondents agreed, whereas 13 (87%) respondents strongly agreed, according to the respondents' feedback.

Analysis Part C: Design Demonstration (Problem Solving)

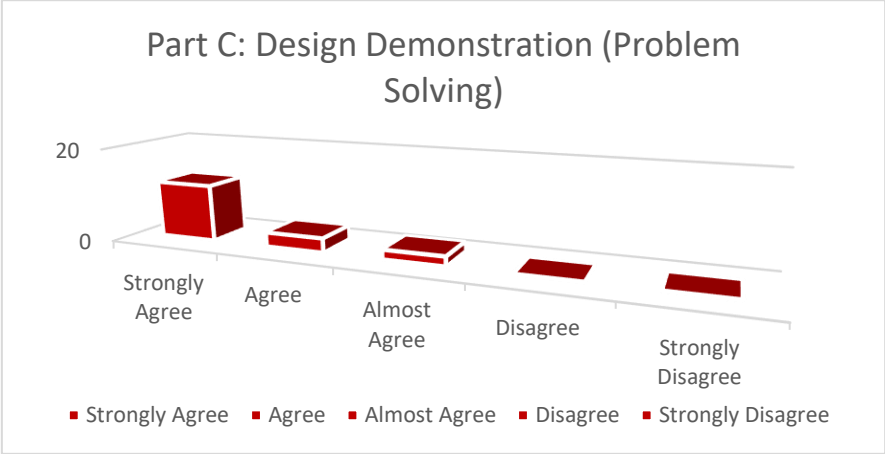

Figure 5: Design Demonstration (Problem Solving) Analysis

The purpose of Part C analysis is to assess how well the DataComm.Net application's demonstration design works. Responses to eight questionnaire items about using the application to access instructional resources including notes, exercises, and useful lab sheets were gathered for the study. Overall, 12 (71%) respondents strongly agreed, 3 (18%) agreed, and 2 (12%) almost agreed that the DataComm.Net application that was created enables students to tackle learning challenges.

Analysis Part D: Motivation-Enhancing Design

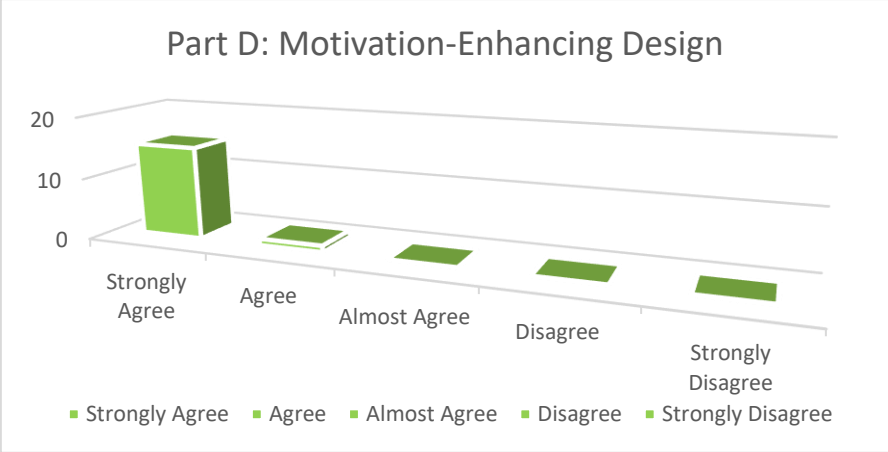

Figure 6: Motivation-Enhancing Design Analysis

The design of this application was examined to determine how well it increased student motivation for the Data Communication and Networking course based on the results of the questionnaire. Students' opinions of the DataComm.Net application and their own evaluations

of how it affected their attitudes regarding networking and data communication were the focus of the question items that were created. 15 (100%) of those surveyed strongly agreed that motivation should be raised.

4. Conclusion

In conclusion, the creation of the DataComm.Net Apps Android application has shown itself to be beneficial and successful in assisting instructors and students in the teaching and learning process, saving time for lecturers, decreasing the need for printed notes, and encouraging students to study the Data Communication & Networking course. It is intended that this application may be updated periodically to ensure that it remains useful and current.

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Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this study.

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