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# ENHANCING NETWORKING EDUCATION THROUGH SWITCHING E COMMAND MOBILE APPLICATION

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## ABSTRACT

*The advancement of mobile technology has changed the practices of education, especially in technical education such as computer networking. This paper describes the creation of Switching E-Command App, an offline mobile application designed to help a networking student learn and practice switching commands. The app was created using Rapid Application Development (RAD) and organizes the instructional content into well-defined lecture notes, categorized command reference, interactive practice, and self-assessment within a simple user interface. An exploratory study with 40 students over two weeks showed good effects, where students reported easy access to the content, increased understanding of the networking commands, and increased confidence in the lab and in the assessment formats. Moreover, students found the offline option greatly valuable in states where there is no or limited internet connectivity. Also valuable was the with in-the-moment feedback the quiz offered, while helping form a connection between theory and practice. Current limitations include only behaviour supports Android devices and only covers the topic of switching. Future extensions may include routing, subnetting, LMS integration. Overall, this project clearly contributes to mobile learning in technical education by allowing for independent study, bridging for the connectivity gaps, and increasing engagement.*

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## 1. Introduction

Mobile apps are now part of education, and students are using them to learn anywhere at any time (Ally, 2019; Crompton & Burke, 2018). This has been particularly useful in terms of technical courses such as Networking where students need to reconcile understanding theory but also developing hands-on skills to which they can't authentically replicate. For many students, recognizing how classroom theory links to real command usage is a challenge (Johannsen et al., 2023). Despite any potential challenges faced at school and home in travelling to campus in a timely manner, learning can be even more difficult in those areas of the world with poor Internet resources (Pedraja-Rejas et al., 2024; Traxler, 2018). The

Switching E-Command App allows for that learning to continue through offline access to notes, commands and quizzes. This develops an opportunity for the student to review and learn outside of a structured environment.

Mobile learning tools like the Switching E-Command App supports blended learning and have been reported by many universities to enhance student engagement (Gikas & Grant, 2013; Huda et al., 2021). They encourage the merging of traditional education with modern learning possibilities, especially for students in low-resource situations (Sung et al., 2021).

## 2. Materials and Methods

The Switching E-Command App was developed using a Rapid Application Development (RAD) process, which places a strong emphasis on short development cycles, user feedback, and iteration (Sommerville, 2016). RAD is appropriate for educational tools since it gives a framework for developers to be responsive to the students' and instructors' needs (Lucidchart, 2020; Martin et al., 2020). Figure 1 describes the four steps taken in developing the Switching E Command App from requirements planning to cutover.

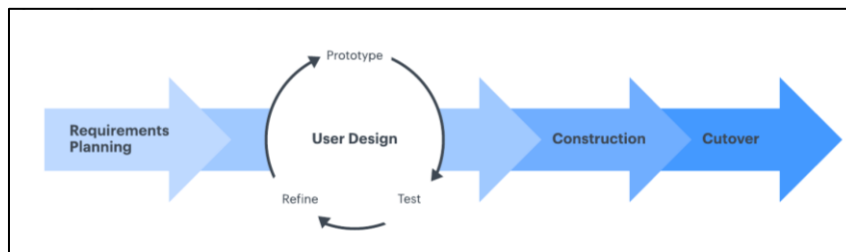


Figure 1. RAD Methodology.

### 2.1 Requirement Planning

During the requirement planning, the team collected data from the students and lecturers by way of surveys, interviews, and observations. Overall, the students found it difficult to memorize the commands in E-Commands and requested helpful support for onsite use that can also work offline. The lecturers stated that whatever the app, content needs to fit within the parameters of their curriculum (Huda et al., 2021).

### 2.2 User Design

The developers created wireframes that captured the layout, navigation, and features to help with the flow of the app. In this stage, the focus was on usability by also consulting students and instructors. The app was intentionally made to be a clean and simple interface that utilized icons and menus to assist with navigation (Gikas & Grant, 2013).

### 2.1 Rapid Construction

The developers utilized the Ionic Framework for the front-end design to ensure cross-device compatibility. Backend functions were created with Node.js and the app was packaged with Android Studio. By taking this route, it ensured a functional and responsive app that is lightweight for as many Android devices as possible. (Crompton & Burke, 2018).

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## 2.1 Cutover

40 students tested the beta version of the app for 2 weeks. During the testing phase, adjustments based on feedback were collected and reviewed to finalize design improvements. Improvements focused on adjustments for quiz errors, navigation modifications, and improvements for visual elements (Crompton & Burke, 2018).

## 3. Results

The development of the Switching E-Command App included four modules: Notes, Commands, Exercises, and Quizzes. In the Notes module, students received explanations structured by topic with diagrams to help students accurately understand the theory. The Commands module provided the different types of switching commands, the category of command such as VLAN, VTP, and Inter-VLAN Routing, syntax, and examples of them. In Exercises module, there were a variety of practice sheet styles like fill-in-the-blank, matching, and short answer to provide students the opportunity to begin to build the command structure. The Quizzes module consisted of multiple-choice assessments to provide students an opportunity to assess their own understanding of the skills they practiced, and for the instructor to keep a record of their progress.

The app was evaluated by 40 students over a two-week period, and it demonstrated a high level of effectiveness. Students liked being able to access all the content offline, and they indicated that it was a benefit for those in areas with inconsistent internet access (Traxler, 2018; Pedraja-Rejas et al., 2024). More than 90% of users thought the app had a clean and easy to navigate interface. They were able to find materials easily and complete their exercises difficulties. Many students indicated that the app made it easier to study, and they reported that they felt more confident during the lab sessions, and assessments (Chandran et al., 2022).

The students enjoyed the immediate feedback offered by the quiz module, which helped them to identify where their weaknesses were and revise them (Sung et al., 2021). Some students also treated the app as a quick-reference tool right before practical exams, thus incorporating the app into their daily study (Huda et al., 2021). When students consistently used the app, instructors noted improvement in command use, student engagement, and overall participation (Johannsen et al., 2023). Technically, the app worked very well on a variety of Android devices without any major bugs or crashes, remaining responsive and stable during the test phase (Crompton & Burke, 2018).

Figure 2 summarizes the student feedback on various aspects of the app, with excellent ratings for offline access, design of interface, and learning effect.

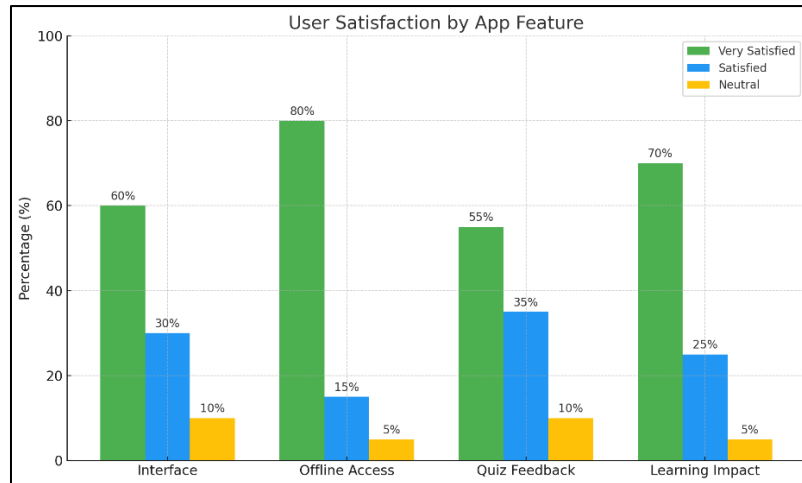


Figure 2. Student Feedback.

#### 4. Discussion

The Switching E-Command App shows how affectively designed mobile apps can fill educational needs for technical subject areas. The offline use of the app was noted to be valuable for the students with limited access to online materials. Feedback showed that the format of the app, with structured interactive tools, increases ease of learning and retention (Pedraja-Rejas et al., 2024; Traxler, 2018). The mixture of notes, commands, exercises, and quizzes create a broad learning environment. In combining theory and practice, students build knowledge and apply importance of what has been learned in real lab environments (Gikas & Grant, 2013).

The success of this app is also well aligned to current research regarding educational technology. There is now enough evidence that mobile learning employs students' motivation, engagement and retention in a more effective way than simply using only traditional instruction (Johannsen et al., 2023; Huda et al., 2021). The use of gamified learning, instant feedback, and learners' choice aids in creating a high-quality learning experience (Sung et al., 2021).

Even though the app offers many benefits, there are limitations to only Android devices and switching topics. Future iterations of the app might can include routing topics, subnetting tutorials, or troubleshooting situations. The app could be transformed into a mobile or web-application providing greater access to the app. Other valuable features might include students' overall performance as well as integration with current LMS platforms for improved learning outcomes (Martin et al., 2020).

#### 5. Conclusion

The Switching E-Command App is a worthwhile application that can enhance the study of networking fundamentals. When used zone offline, structured content, and interactive capabilities, it overcomes the limitations of both traditional and solely online learning (Ally, 2019; Crompton & Burke, 2018). Its acceptance from students and lecturers alike is indicative of its capacity to make a difference.

In the next step, this app could be leveraged to become a more comprehensive platform for delivering content across multiple networking topics and other IT subjects. With some additional features, as well as support across multiple platforms, it has the potential to fundamentally change the engagement level of technical students learning, practicing, and evaluating their skill proficiency (Sommerville, 2016).

By promoting and supporting independent learning as well as bringing together classroom content, and addressing gaps in connectivity, the Switching E-Command App is contributing toward a more equitable, effective, and contemporary means to study (Huda et al., 2021; Pedraja-Rejas et al., 2024).

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