

Students' Perceptions and Learning Experience Using NaviOS in Operating Systems Courses

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Abstract

This study explores students' perceptions and learning experiences using NaviOS, a digital learning platform developed to support the teaching and learning of Operating Systems courses in polytechnic education. The increasing demand for technology-integrated learning environments highlights the need for innovative tools that address challenges such as limited structured materials, low engagement, and difficulties in understanding complex technical concepts. NaviOS was designed as an interactive, centralized, and accessible platform incorporating multimedia elements, real-life analogies, and an AI-powered chatbot to enhance student learning. A quantitative descriptive survey design was employed, using a Likert-scale questionnaire distributed via Google Forms. The study involved 200 Diploma in Information Technology students from Polytechnic Ungku Omar. Data were analyzed to evaluate usability, learning experience, engagement, and students' intention to use the platform. Findings are expected to provide insights into the effectiveness of NaviOS in improving students' conceptual understanding, motivation, and engagement. The study contributes to the growing body of knowledge on digital learning innovations in Technical and Vocational Education and Training (TVET). Additionally, it offers practical implications for educators and policymakers in enhancing curriculum delivery through structured and technology-driven learning approaches aligned with modern educational needs.

Keywords: Digital learning platform, AI-powered chatbot, modules, real-life analogies;

1. Introduction

Operating Systems is a fundamental course in computer science and information technology programmes, as it provides essential knowledge on how computer systems function and manage resources. However, many students encounter difficulties in mastering the subject due to its abstract concepts and technical complexity. Previous studies have shown that students in computing courses often struggle to understand core concepts, especially when learning materials are not presented in a structured and engaging manner [1]. These challenges are further compounded by traditional teaching approaches that rely heavily on theoretical explanations rather than interactive and visual learning methods.

Research in programming education indicates that visual and interactive tools can significantly improve students' understanding of complex topics. For instance, graphical representations such as flowcharts have been proven to help learners better comprehend algorithms and problem-solving processes. Moreover, studies suggest that a large proportion of students are visual learners, making it essential for educators to incorporate multimedia and interactive elements into their teaching strategies [3]. Without such approaches, students may lose interest and motivation, ultimately affecting their academic performance.

In the context of Operating Systems courses, similar challenges exist. Students often face difficulties in visualizing processes such as memory management, process scheduling, and file systems. The lack of centralized and syllabus-aligned learning resources further limits their ability to study effectively [4]. Additionally, limited integration of digital tools in teaching reduces opportunities for active learning and engagement. These issues highlight the need for innovative solutions that can support both teaching and learning processes.

To address these challenges, NaviOS has been developed as a digital learning platform aimed at enhancing students' learning experiences in Operating Systems courses. NaviOS integrates structured content, interactive features, and multimedia elements to facilitate better understanding of abstract concepts. The use of digital platforms in education has been widely recognized as an effective approach to improving student engagement and learning outcomes [8]. Studies have shown that technology-enhanced learning environments can increase students' motivation and participation while providing flexible access to learning materials.

Furthermore, the adoption of digital learning platforms aligns with the current direction of Technical and Vocational Education and Training (TVET), which emphasizes the integration of technology in education. By providing a centralized and interactive learning environment, NaviOS has the potential to overcome the limitations of traditional teaching methods and improve students' academic performance.

Therefore, this study aims to examine students' perceptions and learning experiences using NaviOS, evaluate its effectiveness in enhancing understanding of Operating Systems concepts, and determine its impact on student engagement and motivation. The findings of this study are expected to contribute to the improvement of digital teaching strategies and support the development of more effective learning environments in polytechnic education.

In the era of globalization and digital transformation, the education system requires a more dynamic approach that aligns with the needs of today's generation. Modern students are more motivated to use technology in their daily lives, including in the learning process. Therefore, educational institutions must provide teaching materials that not only meet curriculum requirements but also capture students' interest and support 21st-century learning styles.

Technical courses such as Operating System demand a deep understanding of complex concepts and principles. However, traditional teaching methods such as using textbooks and static notes often fail to meet the needs of students who prefer to learn through visual, interactive, and easily accessible methods. The lack of suitable and structured materials can lead to lack of interest in the course material and make it difficult for them to master it.

The development of a digital learning platform has been recognized as a suitable solution. These platforms offer students the ability to learn at any time and from any location, while also granting access to more organized, engaging, and intelligible content. This directly enhances students' motivation, engagement, and academic success. Besides that, digital learning materials also provides lecturers with the opportunity to deliver lessons in a more systematic and efficient manner. With a complete and centralized reference source, lecturers can plan their teaching more effectively and ensure that students receive consistent information aligned with learning objectives. At the same time, students are also given the space to revise and assess their understanding through self-assessment elements.

Overall, the need for innovation in teaching aids is becoming increasingly important to ensure the quality of teaching and learning remains relevant in today's modern education landscape. Digital learning approaches, as highlighted through this innovation, have the potential to empower students, support lecturers, and strengthen the overall educational process in Malaysia's TVET and polytechnic institutions.

1.2 Product Introduction

NaviOS was developed as a digital learning innovation targeting TVET and polytechnic students by providing a platform based on Google Sites that can be accessed via smartphones, tablets, and computers without the need to install any application. NaviOS integrates modular structures, real-world analogies, interactive quizzes, videos, infographics, and an AI chatbot (OSBuddy) to facilitate students' independent comprehension of OS course at anytime and anywhere. Through this approach, NaviOS not only makes learning OS more engaging and easier to comprehend, but also supports the development of self-directed learning skills, digital readiness, and technological literacy among technical and vocational education students.

Figure 1 shows the main interface of the NaviOS Learning Hub. NaviOS is designed with nine main navigation buttons: Home, About, Notes, Video, Tutorial, Quiz, E-book, Chatbot, and Examination. This layout allows students to easily and quickly access each learning element. The clear and user-friendly navigation supports self-paced learning, as students can move from one module to another without confusion, based on their individual needs and level of understanding.

1.3 Product Image

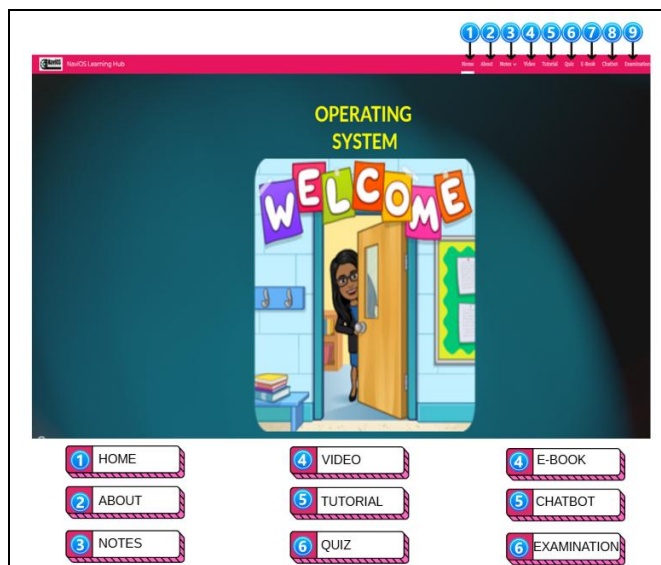


Figure 1: NaviOS Learning Hub Interface

1.4 Features of the Innovative Product

NaviOS was developed using Google Sites and is specially designed to function effectively on smartphones, tablets, and computers. It is tailored to meet the curriculum needs and learning styles of polytechnic students, who are more inclined towards practical and visual-based learning. The following are the key features of the NaviOS innovation:

- **Content structured according to the Polytechnic Syllabus**

The content is organized based on the latest curriculum, allowing both lecturers and students to follow topics systematically. Each chapter includes learning objectives, concise notes, and reinforcement activities.

- **User-friendly design with visually appealing interface**

The platform uses attractive graphics, consistent icons, and appropriate color schemes to enhance the reading experience. Each page layout is designed for easy navigation, even for students with limited digital literacy.

- **Integration of interactive elements**

NaviOS includes interactive elements such as quizzes through Google Forms and QuizWhizzer, links to explanatory videos, real-world analogies, and dynamic diagrams to help students visualize and

better understand complex concepts. It also features an AI chatbot, OSBuddy, which provides quick explanations and assistance.

- **Digitally Accessible Across Multiple Devices**

NaviOS can be accessed via smartphones, tablets, or computers. It allows unlimited access regardless of time or location, supporting flexible learning.

- **Ease of Content Updates**

Unlike printed books, NaviOS content can be easily updated to reflect changes in the curriculum, student feedback, or ongoing improvements. This makes it a dynamic and sustainable resource in the long term.

- **Includes Enrichment and Self-Learning Activities**

Each topic is accompanied by reinforcement questions and sample structured exam questions from past years. This supports independent learning and encourages students to continuously assess their understanding.

Overall, NaviOS integrates modern pedagogical principles, digital technology, and the specific context of polytechnic education to produce a comprehensive, engaging, and high-impact teaching aid.

2. Objective

The objectives of this study are to examine students' perceptions of NaviOS as a digital learning platform and to evaluate their learning experiences in addressing existing challenges such as limited structured materials, difficulty in understanding complex concepts, and low engagement. Additionally, this study aims to determine the effectiveness of NaviOS in enhancing students' understanding of Operating Systems concepts and to identify its impact on improving student engagement and motivation through the use of interactive and centralized digital learning resources.

3. Problem Statement

Despite the importance of Operating Systems courses, students face several challenges that hinder effective learning, including the lack of structured and syllabus-aligned reference materials, difficulty in understanding complex and abstract concepts, limited use of interactive and multimedia teaching tools, low engagement and motivation, and the absence of centralized digital learning resources. These issues indicate a critical need for innovative solutions such as NaviOS, which can provide a more structured, interactive, and engaging learning environment, thereby enhancing students' understanding and overall learning outcomes.

4. Material and Method

This study adopts a quantitative research design using a descriptive survey approach to evaluate students' perceptions and learning experiences using NaviOS. The Goal Question Metric (GQM) approach is applied to define the research goals, develop research questions, and identify appropriate metrics for analysis. Data were collected using an online questionnaire distributed via Google Forms, enabling efficient and systematic data collection.

4.1 Research Goal and Research Questions

To evaluate students' perceptions and learning experiences using NaviOS and determine its effectiveness in enhancing understanding, engagement, and motivation in Operating Systems courses.

4.2 Data sources

The data for this study were collected using a structured questionnaire consisting of Likert-scale items. The questionnaire includes several sections focusing on usability, learning experience, understanding, engagement, and motivation. Responses were measured using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5), allowing quantitative analysis of students' perceptions.

4.4 Participants

The participants of this study consist of approximately 200 Diploma in Information Technology students from the Department of Information and Communication Technology at Polytechnic Ungku Omar. These students have previously taken the Operating Systems course, ensuring that they have relevant experience in evaluating the NaviOS platform.

4.5 Data Analysis

Data analysis was conducted using descriptive statistical methods. Responses collected through Google Forms were automatically compiled and analyzed to obtain frequencies, percentages, and mean scores. The results were presented in the form of charts and tables to facilitate interpretation. This analysis helps to identify trends in students' perceptions, learning experiences, and overall effectiveness of NaviOS as a digital learning platform.

5. Result

This section presents the results of the questionnaire aimed at students' perception and learning experience using NaviOS in Operating System courses. The purpose is to understand how NaviOS contributes to support the teaching and learning of Operating Systems courses in polytechnic education. The analysis focuses on

several key areas: Usability, Learning Experience, Student Engagement, and Intention regarding the use of NaviOS in Operating Systems Courses.

5.1 Perceived Usefulness

Table 1: Result on Perceived Usefulness

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. NaviOS helps me understand Operating Systems concepts more clearly.	61%	39%	0%	0%
2. NaviOS improves my learning performance in this course.	63%	36.5%	0.5%	0%
3. NaviOS is useful for my studies in Operating Systems.	57.5%	42.5%	0%	0%

The results for perceived usefulness indicate a very strong positive response toward NaviOS, with all students either agreeing or strongly agreeing across all statements. A majority of respondents (between 57.5% and 63%) strongly agreed that NaviOS enhances their understanding of Operating Systems concepts, improves their learning performance, and is beneficial for their studies, while the remaining respondents agreed with these statements. There were almost no negative responses, highlighting that NaviOS is widely recognized as an effective and valuable learning tool among students.

5.2 Perceived Ease of Use

Table 2: Result on Perceived Ease of Use

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. I find it easy to navigate within NaviOS.	66%	34%	0%	0%
2. The interface of NaviOS is clear and understandable.	57.5%	42.5%	0%	0%
3. I can use NaviOS without needing much assistance.	60%	40%	0%	0%

The findings show that NaviOS is considered highly user-friendly by students, as reflected by 57.5% to 66% of respondents who strongly agreed that the platform is easy to navigate, has a clear interface, and can be used without much assistance. The remaining respondents agreed with these statements, with no disagreement

recorded. This demonstrates that NaviOS is accessible and intuitive, allowing students to focus on learning without being hindered by technical difficulties.

5.3 Students Engagement

Table 3: Result on Students Engagement

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. NaviOS makes learning Operating Systems more interesting.	64.5%	35.5%	0%	0%
2. I feel more motivated to learn when using NaviOS.	54.5%	45%	0.5%	0%
3. NaviOS keeps me actively engaged during learning.education.	60.5%	39%	0.5%	0%
4. NaviOS encourages me to explore more learning materials.	54.5%	45%	0.5%	0%
5. I enjoy using NaviOS in my learning process.	66	33.5	0.5	0%

The results for student engagement reveal that NaviOS plays a significant role in enhancing students' interest and motivation in learning Operating Systems. A high percentage of respondents (ranging from 54.5% to 66%) strongly agreed that NaviOS makes learning more interesting, keeps them actively engaged, and encourages exploration of additional materials, while the rest agreed. Minimal disagreement (only 0.5%) suggests that the platform is highly effective in fostering active participation and enjoyment in the learning process.

5.4 Learning Experience

Table 4: Result on Learning Experience

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. NaviOS helps me learn at my own pace.	70%	29.5%	0.5%	0%
2. NaviOS supports independent learning.	58.5%	40.5%	1%	0%
3. I am satisfied with my experience using NaviOS	62%	37.5%	0.5%	0%

The learning experience results indicate that students have a highly positive experience using NaviOS, with 58.5% to 70% strongly agreeing that the platform supports self-paced and independent learning. Most of the remaining respondents agreed, with almost no disagreement. These findings suggest that NaviOS successfully promotes autonomy in learning and provides a satisfying overall learning experience for students.

5.5 Behavioral Intention

Table 5: Result on Behavioral Intention

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1. I intend to continue using NaviOS in the future.	66%	34%	0%	0%
2. I would recommend NaviOS to my friends.	56%	44%	0%	0%
3. I prefer using NaviOS compared to traditional learning methods.	63%	36.5%	0.5%	0%
4. I am willing to use similar digital platforms in other subjects.	57%	42.5%	0.5%	0%

The behavioral intention results demonstrate a strong willingness among students to continue using NaviOS and adopt similar digital platforms in the future. Between 56% and 66% of respondents strongly agreed that they would continue using and recommend NaviOS, while the rest agreed. The very low level of disagreement (0–0.5%) indicates a high level of acceptance and satisfaction, suggesting that NaviOS has strong potential for sustained use and broader implementation in education.

6. Discussion and Suggestions

The findings demonstrate that NaviOS is highly effective in enhancing students' learning of Operating Systems, as evidenced by consistently strong positive responses across perceived usefulness, ease of use, engagement, learning experience, and behavioral intention. Students clearly perceive the platform as beneficial in improving their understanding and performance, while its user-friendly interface enables smooth navigation without technical difficulty, contributing to higher engagement and motivation. The ability of NaviOS to support self-paced and independent learning further enhances students' overall satisfaction and learning experience, which is reflected in their strong intention to continue using and recommending the platform. Building on these positive outcomes, several improvements can be considered to further strengthen NaviOS, such as incorporating more interactive features like simulations, quizzes, and instant feedback to deepen engagement, as well as introducing adaptive learning elements to cater to different student abilities. Expanding the implementation of NaviOS to other courses and providing training for educators can also maximize its effectiveness in teaching practices. Additionally, future studies should involve a larger sample size and include qualitative approaches to gain deeper insights, while also examining long-term impacts on academic performance to further validate the platform's effectiveness.

7. Conclusion

In conclusion, this study confirms that NaviOS is a highly effective digital learning platform that positively influences students' understanding, engagement, and overall learning experience in Operating Systems courses. The strong agreement across all measured areas indicates high acceptance, usability, and satisfaction among students. NaviOS not only supports independent and self-paced learning but also enhances motivation and interest, making it a valuable tool in modern education. Given the strong behavioral intention to continue its use, NaviOS shows great potential for wider implementation in other subjects and institutions. Continuous improvement and further research will help ensure its sustainability and effectiveness in supporting future teaching and learning practices.

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