ENHANCING LEARNING OUTCOMES BY USING SOME ELECTRONIC TECHNOLOGIES

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ABSTRACT

Since 2018, Mongolian National Defense University (MNDU) has been implementing CDIO standards and methodologies in its teaching activities. To enhance student knowledge and skills, MNDU has integrated various e-learning technologies into its curriculum. This study investigates the impact of Microsoft OneNote on student learning outcomes by analyzing its effects on information retention, note-taking efficiency, and student engagement. The study involved first- to fourth-year students in the Department of Engineering at MNDU, comparing traditional face-to-face lectures with the integration of Microsoft OneNote.

KEYWORDS

Flipped classroom, digital note-taking, Microsoft OneNote, student engagement, academic performance, Standards 5, 7, 8, 9

INTRODUCTION

The rapid digital transformation in education has necessitated an increased reliance on e-learning tools to enhance student engagement and optimize learning efficiency. Engineering education, in particular, benefits significantly from digital note-taking applications, which enable students to systematically structure information, integrate multimedia resources for enhanced comprehension, and foster collaborative learning. However, existing challenges such as information overload, inefficient self-regulation, and difficulties in adapting to digital platforms continue to hinder effective utilization.

This study critically examines the role of Microsoft OneNote as a digital note-taking tool in engineering education, assessing its impact on students' academic performance, cognitive retention, and organizational skills. Unlike other note-taking applications, OneNote offers advanced features, including hierarchical organization, seamless cloud synchronization, and collaborative functionalities. By addressing these challenges, this research seeks to provide empirical insights into how OneNote facilitates skill development and enhances academic success within an engineering education context.

RELATED WORKS

Previous research on digital note-taking in education highlights its potential benefits, including enhanced memory retention, improved organizational skills, and increased student engagement. Wong et al. (2022) explored the integration of Microsoft OneNote in university classrooms, finding that it facilitated collaborative learning and improved information structuring. Michaelsen (2020) emphasized the role of digital tools in modern education, arguing that platforms like OneNote enable a seamless blend of traditional and digital note-taking. Sekarasih and Yani (2016) investigated the effectiveness of OneNote in language learning, revealing significant improvements in student participation and comprehension.

While these studies establish the advantages of digital note-taking, few have explored its specific impact on engineering education. This study builds upon prior work by assessing how Microsoft OneNote influences students' ability to process and retain complex technical information.

Aim of the research work

To assess the impact of Microsoft OneNote on student learning outcomes in engineering education.

Research objectives

- To analyze the time students spend using Microsoft OneNote for academic purposes.
- To conduct a survey measuring the effectiveness of Microsoft OneNote in improving note-taking skills.
- To evaluate the skills most enhanced by using Microsoft OneNote, including information organization, problem-solving, and collaboration.

In this article, we share our experiences using some of the software and electronic technologies in our lessons.

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METHODOLOGY

This study employed a mixed-methods approach, combining quantitative surveys and qualitative observations. A total of 150 students from the Department of Engineering participated in the research. The methodology included:

- **Survey Design:** A structured questionnaire was developed to assess students' use of OneNote, their engagement levels, and perceived benefits.
- **Data Collection:** Surveys were distributed online, and focus group discussions were conducted to gather qualitative insights.
- **Data Analysis:** Descriptive statistics were used to quantify student responses, while thematic analysis was applied to interpret qualitative feedback.

FINDINGS AND ANALYSIS

While the rapid development of technology has been a positive aspect, the ability of young people to use technology is increasing, but due to the lack of self-management skills of students, they are increasingly getting lost in the online environment and spending time ineffectively, as is clear from the results of this survey question. For example: 37.9 % of students spend 3-4 hours ineffectively on the Internet.

How many hours per day do you approximately spend unproductively on the internet?
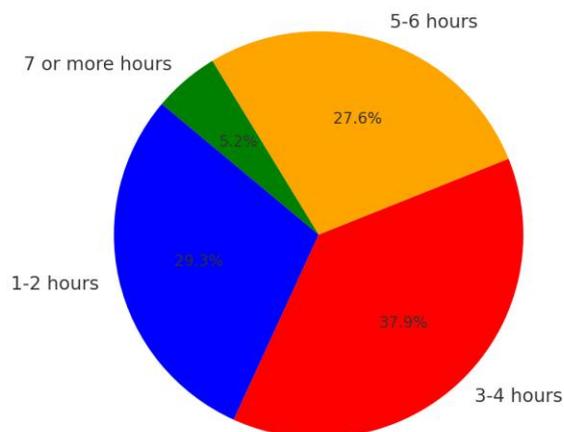(58 responses)

Figure 1. Survey of student internet usage

Figure 1. % of survey participants said they spend 1-2 hours effectively on the internet.

How many hours per day do you approximately spend productively on the internet?
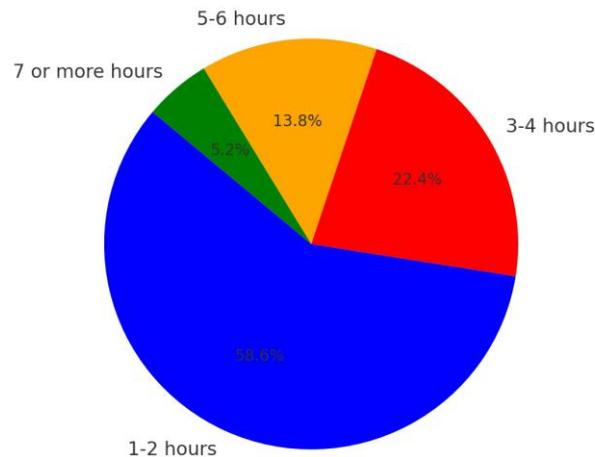(58 responses)

Figure 2. Survey of students' internet usage

We, the researchers, have studied the results of the above study and have come to the following solutions, examining how to resolve them positively. These include :

It is believed that it is a top priority for students and listeners of the National University of Economics, as well as students of other universities and colleges, to learn the skills of taking notes in both manual and electronic form, which will significantly reduce the time spent ineffectively on the Internet. Here are some brief methods for taking notes online:

There are 4 main ways to take notes by hand.

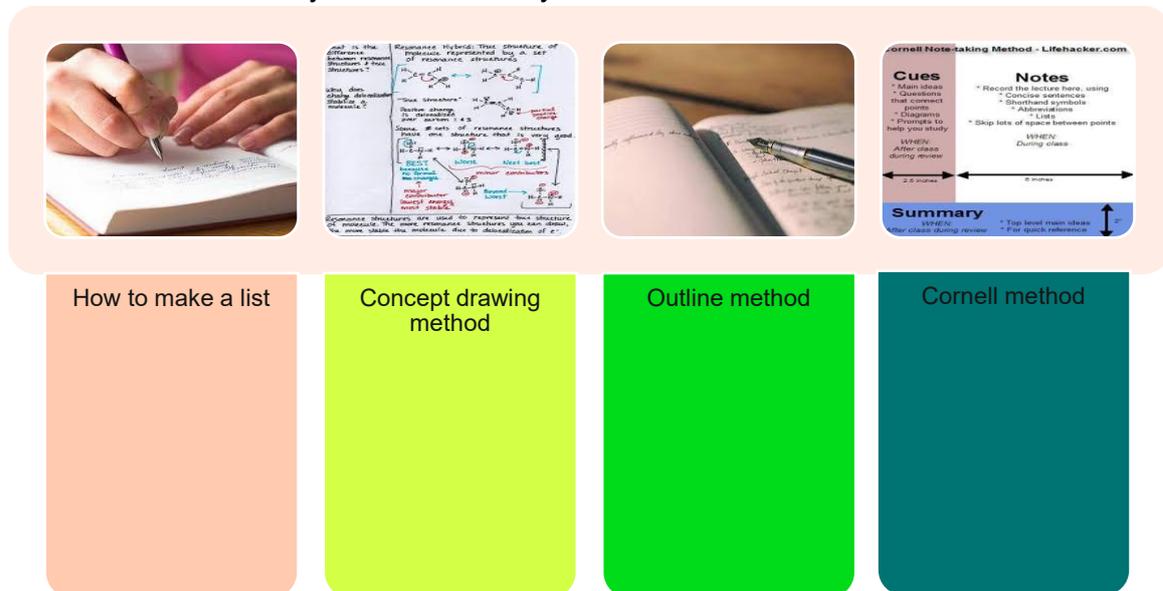| How to make a list | Concept drawing method | Outline method | Cornell method |

Figure 3. Manual note-taking methods

Let's briefly introduce some online note-taking programs. These include:

- OneNote
- Evernote
- Keep
- Simplenote

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- Notion
- Diego
- Zoho Notebook
- WizNote
- WorkFlowy
- There are apps like Nimbus Note.

Of these methods, the following methods were used in training and the results were analyzed.

Microsoft OneNote allows you to create an unlimited number of notebooks, which can be divided into pages and sections. All this creates a multi-level data structure and helps you organize information intelligently. Handwriting and drawing functions are supported, and you can insert web videos and screenshots, record audio notes, and add Word documents, Excel spreadsheets, and PowerPoint presentations as file attachments or virtual prints (images). The most recent important entries can be tagged for quick access later, and notebooks with confidential information can be password-protected. OneNote has advanced search tools and allows you to share notes with colleagues, friends, and family. Without a Microsoft 365 subscription, users only get the basic features of OneNote and 5GB of cloud storage. The free option does not support notebook or handwriting recognition and reduces the ability to solve mathematical equations, but OneNote is a great option for taking notes and organizing personal information.

User surveys also show that the method can be beneficial when used for meetings, and seminars, taking class notes, and developing thesis papers.
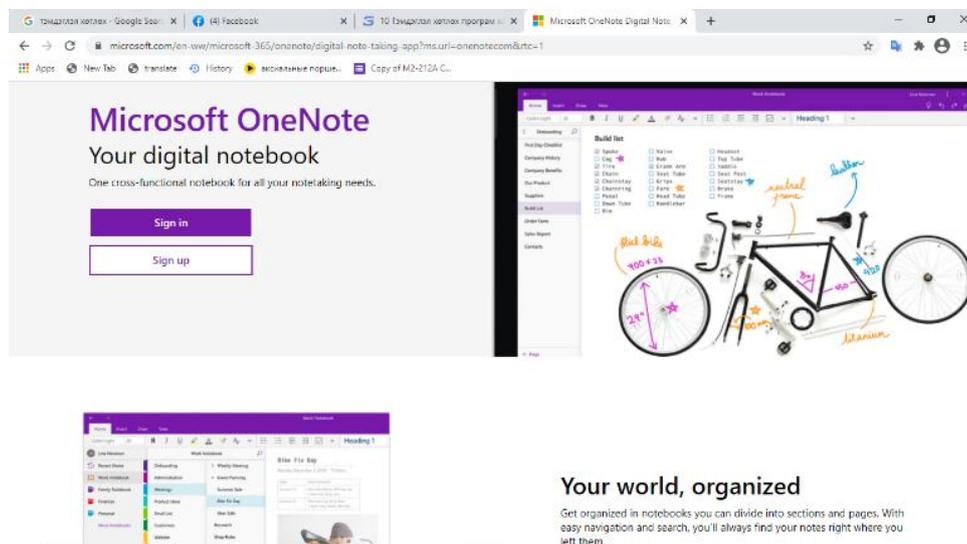

Figure 4. Appearance of the Microsoft OneNote electronic note-taking program
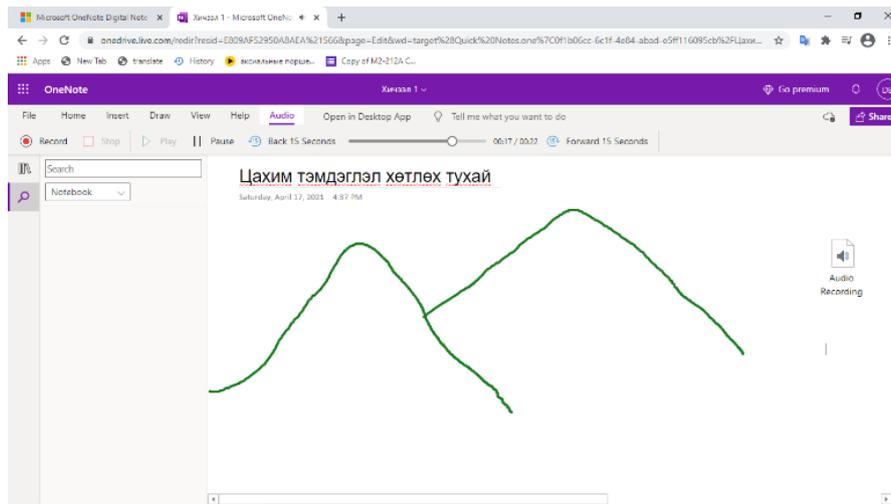
Figure 5. The note-taking area in the Microsoft OneNote electronic note-taking program
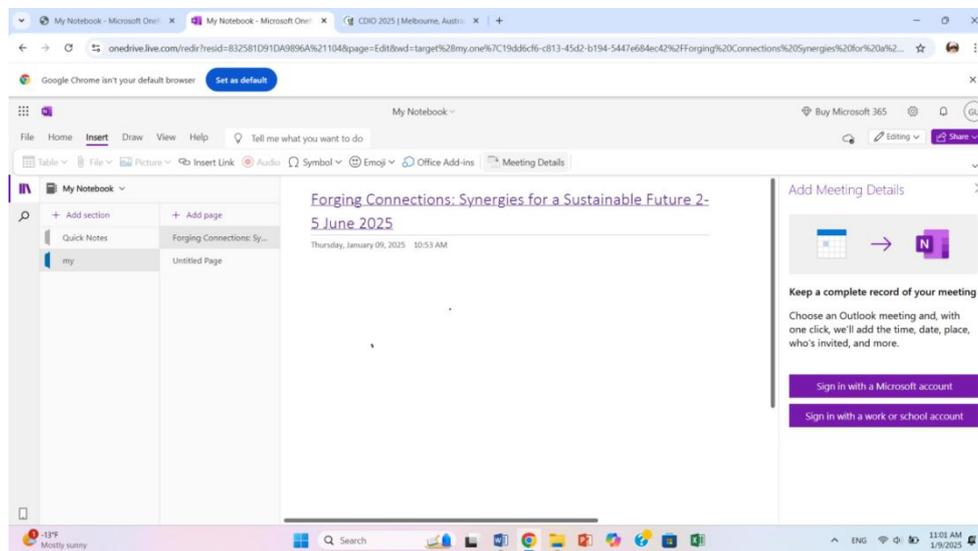

Figure 6. Microsoft OneNote link insertion and meeting time entry field

Also, based on the interests of students and the demands of employers, there is a legitimate need for teachers and students to widely use drawing and calculation computer programs and mobile applications, which is believed to be another way to increase learning outcomes and positively impact the academic success of students and listeners.

In line with the current situation, by changing the way students take notes, and combining handwritten notes with electronic technology, students' computer skills have improved, and they can summarize a wide range of knowledge and draw conclusions in a short time.

Microsoft OneNote from 1st to 4th year students of the Engineering Department of the National University of Economics and Business Administration and conclusions were drawn from the results. 100% of the students of the department participated in the survey and freely expressed their opinions.
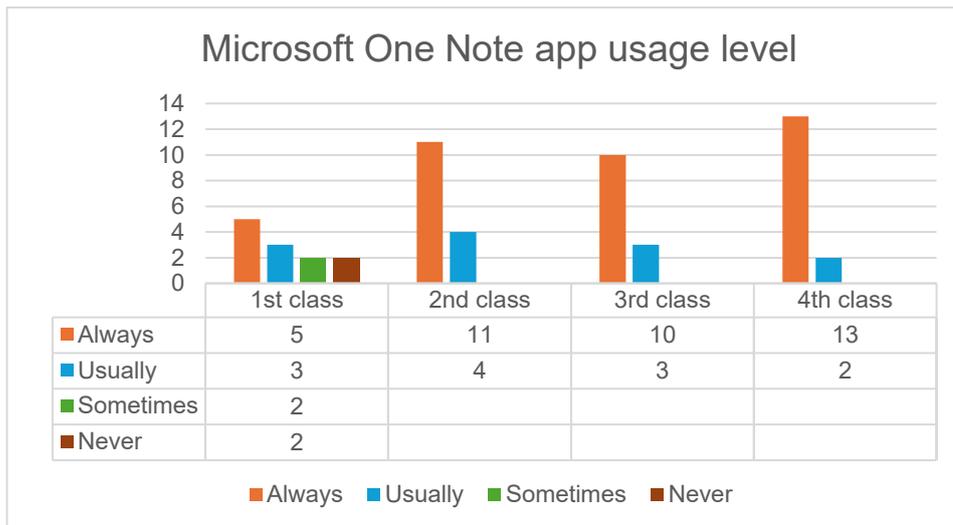
Figure 7. Microsoft OneNote usage rate

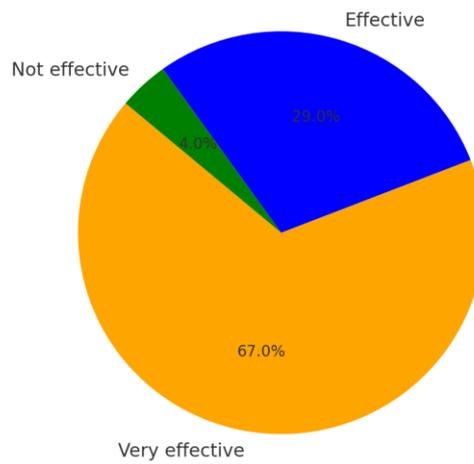How effective is using Microsoft OneNote compared to keeping handwritten notes?

Figure 8. Satisfaction of Microsoft OneNote users

Changes in student skills after using Microsoft One Note

Values shown: 41 (Computer typing skill), 47 (Use multiple sources of information), 38 (information processing skill), 51 (Exchange information with others), 2 (No skills have changed.)

■ What skills have changed in your life since using Microsoft One Note?
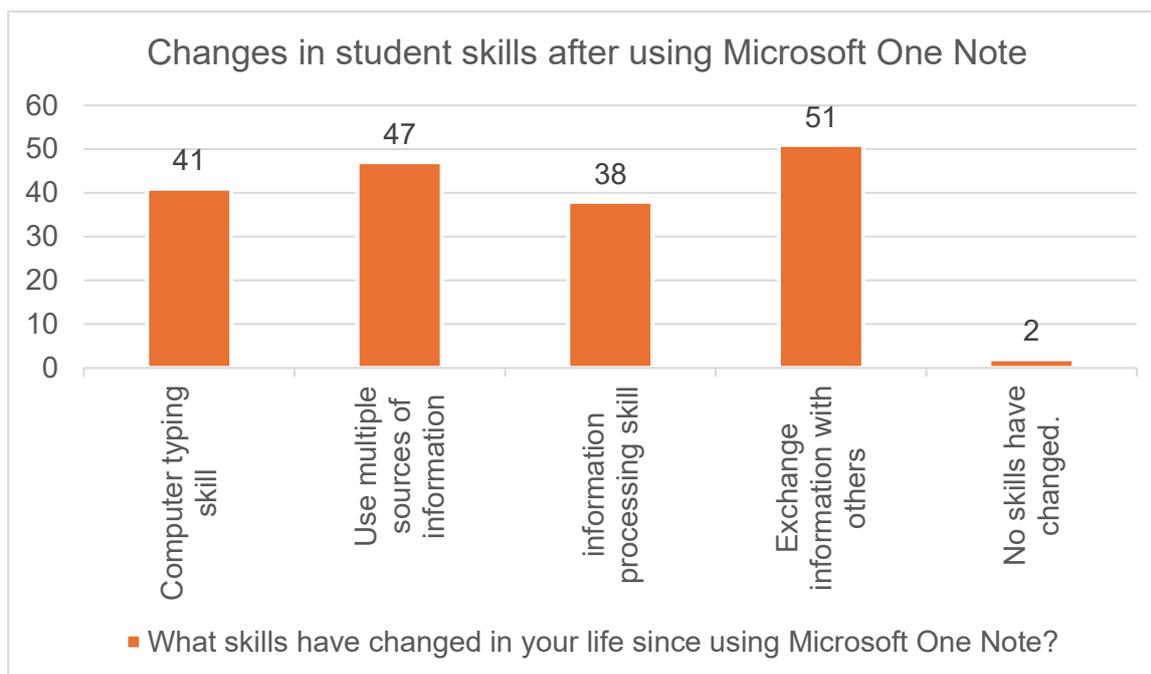
Figure 9. Changes in Microsoft OneNote user skills

Teachers who used Microsoft OneNote in their lessons used an assessment rubric to determine the skills students in the department learned through the program.

Rubric assessment of skills learned using Microsoft OneNote

Criteria	1-Not used at all	2-Interested	3-Sometimes used	4-Use yourself	5-Teaching others	Rating percentage
Ability to use Microsoft OneNote	Didn't learn the program at all.	Write notes on the program.	Write notes and draw pictures in the app.	Write notes, draw pictures, download files, and process information from multiple sources.	You can use all the program commands yourself and teach them to others.	0-100 %
Total points	0	20	50	80	100	100 %

When all students of the Engineering Department of the Security Institute of the National University of Mongolia were given a specific task and their skills in using Microsoft OneNote were assessed using a rubric, the following picture emerged: 50-70 percent of students learned to use it themselves and were able to teach it to others.

Assessment of student skills
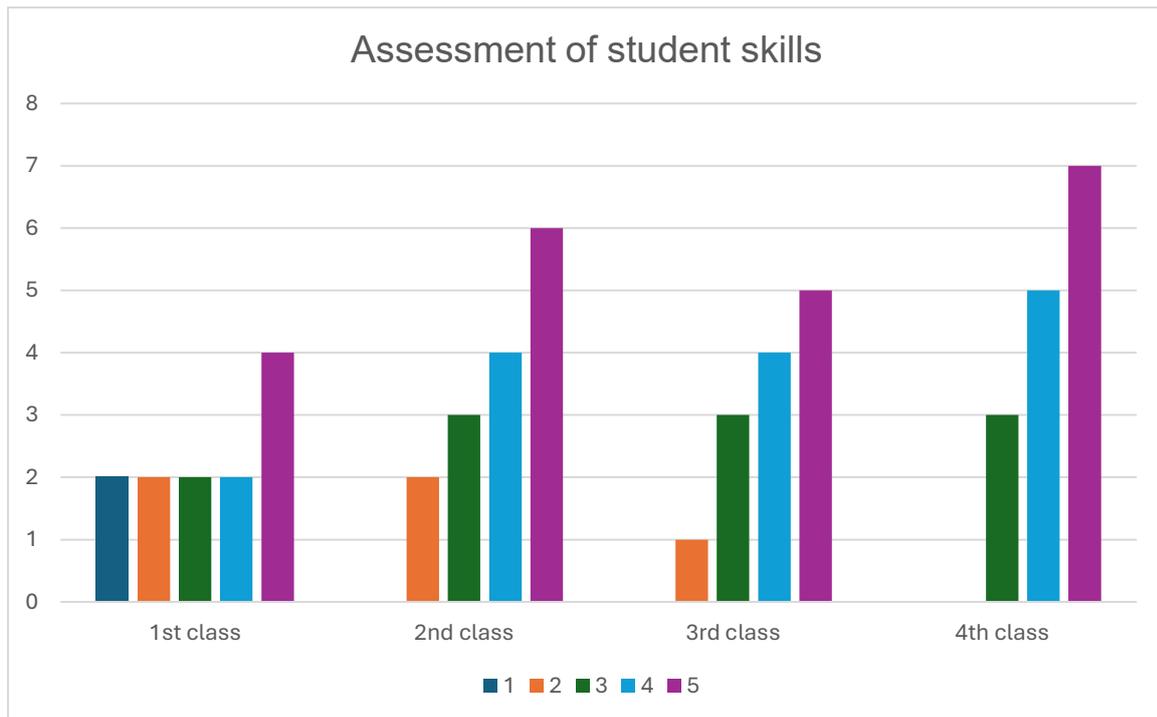
RESULTS AND DISCUSSION

Student Time Allocation in Digital Environments. Survey results indicate that while students spend significant time online, a notable portion is used inefficiently. Approximately 37.9% of students reported spending 3-4 hours online without clear academic objectives. The integration of OneNote reduced this inefficiency by promoting structured study sessions.

Impact of OneNote on Note-Taking Skills. A comparative analysis of student performance before and after implementing OneNote revealed improvements in note organization, accessibility, and retention. Figures 1 and 2 illustrate the increased adoption of structured note-taking practices among students.

Student Perception and Satisfaction. Survey responses indicated high satisfaction levels among students using OneNote. Approximately 80% reported that OneNote improved their ability to consolidate lecture materials, while 65% found it enhanced their problem-solving skills.

Skill Development Through Digital Note-Taking. A rubric-based assessment demonstrated that 70% of students reached proficiency levels where they could independently use OneNote for academic purposes, and 30% progressed to teaching others. This indicates that digital note-taking fosters self-directed learning and peer collaboration.

CONCLUSION

This study confirms that integrating Microsoft OneNote in engineering education significantly enhances student learning outcomes. Key findings include improved note organization, increased academic engagement, and the development of digital literacy skills. However, proper implementation by educators remains crucial to maximizing the benefits of digital tools. Future research should explore long-term impacts and investigate the integration of other digital platforms in engineering education.

ACKNOWLEDGEMENTS

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BIOGRAPHICAL INFORMATION

Darkhantsetseg Batsumber is working as an educator at Mongolian National Defense University's Institute of Safety's Department of Engineering. Graduated with bachelor's and master's degrees in Mechanical engineer of road transport and construction machinery, and currently a PhD student at the Mongolian University of Science and Technology. Continuously doing research work on the topic of wear of excavator blades and teeth. Advanced CDIO standards and methods master teacher.

Temuujin Altansukh has been working as a teacher since September 2023 at Mongolian National Defense University's Institute of Safety's Department of Engineering. Graduated with a bachelor's degree "Mechanical Engineering" at MNDU. He studied UNESCO's Usage of artificial intelligence in high school and was certified as a master teacher at Mongolian University of Science and Technology. Now he is studying for a master's degree in "Cyber Security" at MNDU.

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