Sprin Journal of Arts, Humanities and Social Sciences

ISSN: 2583-2387 (Online)

Vol. 4(3), May 2025, pp, 6-12

Journal homepage: https://sprinpub.com/sjahss

Research Article

# CHALLENGES OF NOTE-TAKING IN POWERPOINT-BASED LECTURES: AN ANALYSIS OF FIRST-YEAR STUDENTS AT MUKUBA UNIVERSITY

*Chishiba Gerald*[1*], *Mukuka Joseph*[2]

[1,2]*Department of Arts, Languages and Literary Studies, University of Zambia, Zambia*

ARTICLE INFO

***Keywords:***

Cognitive overload, student engagement, note-taking strategies, technology in education, active learning, and higher education

***Article History:***

Received: 11-03-2025

Accepted: 01-05-2025

Published: 10-05-2025

ABSTRACT

This mixed-methods study rigorously examines the cognitive and engagement challenges faced by first-year university students across four disciplines—Non-Quota, Nutrition Sciences, Education, and Computer Science—when engaging with PowerPoint-based lectures. A total of 60 students were selected using stratified purposive sampling to ensure discipline-specific representation. The study aims to critically assess the impact of PowerPoint presentations on cognitive overload, student participation, note-taking strategies, and the effective use of technology within lecture environments. The findings reveal that PowerPoint lectures, often characterized by fast-paced, information-dense slides, significantly contribute to cognitive overload. Students struggled with divided attention, attempting to transcribe slides while simultaneously processing verbal explanations, which led to shallow, passive learning. The teacher-centred nature of these lectures further diminished opportunities for active student engagement and critical thinking, as students primarily focused on transcribing content rather than interacting with the material in meaningful ways. Notably, the study highlights the prevalent use of passive note-taking strategies, such as verbatim transcription or photographing slides, which undermined deeper cognitive engagement and hindered information retention. While technology was perceived as a tool for enhancing learning, its use was often counterproductive, as it acted more as a distraction than an aid to understanding, particularly when students resorted to capturing slides rather than engaging critically with the content. This research highlights the pressing need for educators to recalibrate PowerPoint usage in ways that foster active learning. By designing less cognitively demanding slides, integrating interactive pedagogical strategies, and providing explicit guidance on effective note-taking techniques, instructors can mitigate the cognitive overload experienced by students. This study contributes significantly to the discourse on pedagogical practices in higher education, offering actionable recommendations to enhance the efficacy of PowerPoint-based instruction and promote deeper, more meaningful learning experiences across disciplines.

***Cite this article:***

Gerald, C., & Joseph, M. (2025). CHALLENGES OF NOTE-TAKING IN POWERPOINT-BASED LECTURES: AN ANALYSIS OF FIRST-YEAR STUDENTS AT MUKUBA UNIVERSITY. Sprin Journal of Arts, Humanities and Social Sciences, 4(3), 6–12. https://doi.org/10.55559/sjahss.v4i3.505

## 1. Introduction

In recent years, PowerPoint has become a ubiquitous tool in higher education, transforming how content is delivered and consumed in the classroom. Its ability to present information in an organized, visually engaging format has been praised for its potential to enhance clarity and student understanding (Kim, 2018). PowerPoint's multimedia features, such as images, videos, and graphs, can promote greater engagement and memory retention (Chen, 2024). However, despite these advantages, increasing concerns have emerged regarding its impact on active learning, particularly with respect to note-taking. In a PowerPoint-driven environment, students may fall into passive consumption, focusing on copying slides verbatim rather than actively engaging with the material and critically processing the information (Frey & Birnbaum, 2002). The shift toward PowerPoint-based lectures raises the critical question of how it influences students' learning processes, particularly their ability to take meaningful, analytical notes.

Globally, research on the effects of PowerPoint on student learning has been robust. In Western educational contexts, studies have shown that PowerPoint can lead to passive learning, where students become more focused on transcribing the slides than synthesizing and reflecting on the content (Mueller & Oppenheimer, 2014). Research by Kindschi (2019) indicates that PowerPoint presentations encourage students to copy information directly from the slides, which hampers their ability to engage with the material critically. This type of passive note-taking limits comprehension and retention, as it bypasses the cognitive processes necessary for deep learning, such as summarization,

*Corresponding Author:

geraldchishiba@gmail.com (C. Gerald)

https://doi.org/10.55559/sjahss.v4i3.505

paraphrasing, and critical analysis (Palmatier & Bennett, 2016). Furthermore, studies by Williams et al. (2017) show that PowerPoint's linear structure and often oversimplified content reduce students' opportunities for cognitive processing and reflection, resulting in shallow learning experiences.

While PowerPoint has dominated classrooms in the United States, Europe, and Asia, the use of such digital tools in African higher education is relatively new and growing. In many African universities, the integration of technology into teaching and learning processes is seen as a way to improve the quality of education and overcome infrastructural and resource challenges (Meer, 2012). In countries such as South Africa, Kenya, and Nigeria, PowerPoint has become increasingly common, but the effects of such technology on student learning have not been adequately explored, especially in the context of note-taking. In Zambia, the shift toward digital teaching methods, including the use of PowerPoint, is more recent, and universities like Mukuba University have gradually adopted these tools as part of their teaching strategies. However, the challenges associated with PowerPoint-based lectures, especially in terms of note-taking and engagement, have not been extensively researched, particularly from the perspective of first-year students.

In Zambia, where educational institutions are rapidly adopting digital technologies, the situation is multifaceted. While Mukuba University is transitioning to PowerPoint-based lectures, there is a lack of research into how students at this institution adapt to this teaching style and whether it helps or hinders their learning, especially during their first year. First-year students, in particular, face the unique challenge of adjusting to university-level academic demands. They are not only learning how to manage the complexity of university content but also adapting to new modes of learning, such as PowerPoint-based lectures. The reliance on PowerPoint in these settings could potentially undermine the development of crucial academic skills like effective note-taking. As a result, students may be more likely to passively record information, which may limit their ability to synthesize, retain, and engage with course content.

Given that note-taking is a critical component of the learning process, it is important to investigate whether PowerPoint-based lectures at Mukuba University are inhibiting students' ability to take effective notes. Research has shown that effective note-taking promotes better comprehension, retention, and overall academic performance (Freeman et al., 2014). However, the reliance on PowerPoint slides may reduce students' opportunities to engage in these cognitive processes. For example, if students focus primarily on transcribing slide content, they may miss the opportunity to organize information in their own words or make connections between concepts, which are key to developing a deep understanding of the material (Mueller & Oppenheimer, 2014).

This study is significant for several reasons. First, it contributes to the growing body of research on the use of PowerPoint in higher education, particularly in the African context. Much of the literature on educational technology has focused on developed nations, and there is limited research on the challenges faced by students in Zambia and other African countries. By focusing on first-year students at Mukuba University, the study provides valuable insights into how students in Zambia cope with the challenges of PowerPoint-based learning. Second, this research will contribute to the literature on note-taking, an essential skill in academic success. Finally, the findings will contribute to the broader conversation about the integration of educational technology in African universities, providing evidence-based recommendations for optimizing PowerPoint use to improve student learning outcomes.

This research aims to examine how first-year students at Mukuba University engage with PowerPoint-based lectures, specifically in relation to their note-taking practices. By exploring the challenges faced by these students, this study will provide insights into how PowerPoint-based learning affects their learning processes and whether it limits their ability to take meaningful, analytical notes. In particular, the study sought to answer the following research questions:

1. How do first-year students engage with PowerPoint-based lectures in terms of note-taking?
2. What challenges do first-year students face when taking notes during PowerPoint-based lectures?
3. To what extent do PowerPoint-based lectures hinder the development of effective note-taking skills among first-year students?
4. How do first-year students perceive the impact of PowerPoint-based lectures on their learning and academic performance?

These questions were central to understanding the dynamics of PowerPoint-based learning in the context of note-taking and provided the foundation for exploring students' perceptions of their academic performance.

## 2. Literature Review

### *2.1 General Discussion*

The role of note-taking in enhancing learning outcomes has been extensively studied, particularly in the context of technology-enhanced lectures. With the widespread adoption of PowerPoint presentations and digital lecture materials, the effectiveness of different note-taking strategies and slide accessibility remains a subject of debate. This review critically synthesizes existing literature on the impact of slide-based lectures, note-taking strategies, and the cognitive implications of information processing in higher education.

### *2.2 The Effect of Slide Accessibility on Learning*

Kim (2018) investigated the impact of slide accessibility on students' memory retention, distinguishing between full, partial, and no slide copy conditions. The study revealed that students without access to slides performed better in both immediate and delayed memory tests, suggesting that the absence of slides forces active engagement with lecture content. Interestingly, partial slide access showed potential benefits for long-term memory encoding, highlighting a nuanced relationship between cognitive effort and retention.

Similarly, Marsh and Sink (2009) explored whether providing lecture slides before class enhanced students' ability to encode and recall information. Their findings suggested that while students preferred having slides in advance, those who had access to them engaged in less note-taking, which could undermine deep learning. However, access to slides did improve test performance, indicating that structured materials may aid information processing when used appropriately.

### *2.3 Note-Taking as a Learning Strategy*

Note-taking is widely regarded as a critical academic skill, yet research suggests that students often overestimate their proficiency in it. Williams et al. (2017) examined students' ability to discern relevant information from PowerPoint slides, finding that many students lacked training in effective note-taking despite considering themselves proficient. The study underscores the importance of explicit instruction in note-taking strategies,

particularly in environments where PowerPoint is the primary mode of lecture delivery.

Meer (2012) echoed this concern, noting that first-year university students struggle with note-taking and often prefer to receive pre-prepared notes. This preference raises questions about the continued relevance of note-taking as a skill in the digital age. Meer's findings suggest that educators need to rethink their role in facilitating effective note-taking, possibly integrating training modules on strategic note-taking techniques.

In contrast, Zellhoefer et al. (2010) found only marginal benefits of note-taking on retention, with no significant effects from PowerPoint usage or lecture speed. This suggests that note-taking alone may not be a sufficient learning strategy unless combined with other cognitive engagement techniques.

### *2.4 The Role of Lecture Speed and Cognitive Load*

The increasing prevalence of pre-recorded lecture videos has introduced new variables into the study of learning efficiency. Chen et al. (2024) examined the interaction between lecture speed and note-taking on memory retention. Their findings indicate that while increasing lecture speed (up to 2x) does not drastically impair memory, note-taking remains an essential compensatory mechanism. This suggests that students should be encouraged to take notes even in accelerated learning environments, as it provides mnemonic benefits.

Moreover, Nouri and Shahid (2008) highlighted the cognitive overload that PowerPoint presentations can introduce, particularly when slides contain redundant or excessive information. They argue that the design of slides plays a crucial role in determining whether they aid or hinder learning, supporting the view that slide quality, rather than mere access, is a key determinant of educational effectiveness.

### 2.5 *PowerPoint-Based Lectures: Benefits and Challenges*

PowerPoint-based lectures have transformed traditional teaching methodologies, offering structured content delivery, multimedia integration, and ease of revision for students. According to Bartsch and Cobern (2003), well-designed PowerPoint slides enhance engagement and comprehension by presenting information in an organized manner. They found that students who attended PowerPoint-based lectures with relevant visuals performed better on comprehension tests compared to those who attended traditional board-based lectures.

However, PowerPoint can also introduce challenges, particularly when slides are overloaded with text or presented too quickly for students to process effectively. Mayer (2009) emphasized the importance of multimedia learning principles, cautioning against excessive text on slides and advocating for a balance between visuals and spoken explanations. Poorly designed slides can lead to cognitive overload, diminishing learning outcomes rather than enhancing them.

Additionally, research by Kosslyn et al. (2012) suggests that student engagement with PowerPoint lectures depends on interactivity. Passive learning environments where students merely copy information from slides without discussion or application tend to be less effective. The study highlights the need for educators to incorporate interactive elements, such as guided note-taking, audience response systems, and discussion prompts, to maximize the benefits of PowerPoint-based lectures.

### 2.6 *Student Perceptions of PowerPoint and Learning Outcomes*

Frey and Birnbaum (2002) explored students' perceptions of PowerPoint lectures, reporting a general preference for slide-based presentations over traditional board-based lectures. Students felt that PowerPoint improved organization and note-taking efficiency, yet their study did not establish a direct link between PowerPoint use and improved academic performance. This aligns with findings by Williams et al. (2017) that highlight discrepancies between students' perceptions and actual note-taking effectiveness.

Further, a study by Susskind (2005) found that students in PowerPoint-based lectures reported higher motivation and perceived learning benefits compared to those in traditional lectures. However, test performance did not significantly differ, reinforcing the idea that while PowerPoint may enhance engagement, learning outcomes depend on factors such as slide design, delivery pace, and student interaction.

### 2.7 *Literature Summary*

The literature collectively suggests that while PowerPoint and digital lecture materials offer structural benefits, their effectiveness depends largely on how they are used. Slide accessibility influences cognitive engagement, with restricted access potentially fostering better memory retention. Note-taking remains a critical skill, though many students lack formal training in it. Lecture speed and cognitive load also interact with learning strategies, emphasizing the need for adaptive approaches. PowerPoint-based lectures, while generally preferred by students, require careful design to avoid cognitive overload and ensure effective learning. Future research should explore how best to integrate these insights into instructional design, ensuring that technology enhances rather than impedes learning outcomes.

## 3. Methodology

This section outlines the methodology employed to investigate the challenges of note-taking during PowerPoint-based lectures. The study adopted a mixed-methods approach, combining both quantitative and qualitative data collection techniques. This comprehensive approach allowed the researchers to gather both statistical evidence and in-depth personal insights from participants.

### *3.1* Research Design

The research followed a descriptive, exploratory, and explanatory design. The descriptive aspect of the design allowed for a comprehensive examination of students' experiences with PowerPoint in lectures, while the exploratory element aimed to identify the factors that contributed to difficulties in note-taking. The explanatory dimension provided a framework for understanding how PowerPoint-based learning environments may hinder or facilitate students' ability to take effective notes and engage with the lecture material.

### *3.2 Research Approach*

The study used a mixed-methods approach, which combined both quantitative and qualitative data collection techniques. This approach was chosen because it allowed for a comprehensive understanding of the challenges students face when taking notes in PowerPoint-based lectures, capturing both statistical trends and deeper insights into student experiences.

A structured survey was designed to collect data on students' note-taking behaviours, the frequency with which they used PowerPoint in their lectures, and their self-reported academic performance. This approach provided broad insights into the general trends and patterns of students' experiences with PowerPoint-based learning, including the types of note-taking strategies they employed, their perceived understanding of lecture content, and their level of engagement during the lectures. By using a survey, the study was able to collect data from a large sample, ensuring that the findings reflected the views of a representative group of students.

In addition, in-depth interviews and focus group discussions were conducted to capture the different students' experiences and perceptions. The qualitative approach provided the opportunity to explore the underlying reasons for the challenges students faced with note-taking during PowerPoint-based lectures. It also enabled the researchers to gather detailed feedback on how PowerPoint presentations influenced students' academic performance and learning experiences. These in-depth methods allowed for a deeper exploration of student thoughts and offered more context to complement the quantitative data. This integration of both methods, the research ensured a well-rounded exploration of the topic, as the combination of broad statistical data and rich, personal narratives offered a comprehensive view of the issue.

### *3.3 Population and Sampling*

The target population for the study consisted of first-year students enrolled at Mukuba University, particularly those attending courses that heavily utilized PowerPoint presentations in their lectures. First-year students were chosen because they are in the midst of adapting to the academic demands of university life, and thus may face unique challenges in terms of effective note-taking and engagement with new learning technologies.

A stratified random sampling technique was used to select a sample of 60 students from four academic disciplines: Nutrition Science, Computer Science, Education, and Non-Quota students. Stratification was done to ensure a diverse representation of disciplines, as students from different academic backgrounds may have different experiences with PowerPoint-based learning and note-taking. Each discipline was represented by 15 students, allowing the study to capture a range of perspectives from across multiple fields of study. This method ensured that the sample was both diverse and representative of the broader student body, providing a comprehensive view of the issue.

For the qualitative portion of the research, purposive sampling was used to select 20-25 students from the 80 participants who had completed the survey. These students were chosen based on their willingness to participate and their ability to provide rich, detailed insights into their experiences with PowerPoint-based lectures. The qualitative sample included a mix of students from different academic disciplines, ensuring that the perspectives shared in the interviews and focus groups were varied and reflective of the broader student population.

### *3.4 Data Collection Methods*

The data collection methods employed in this study were designed to ensure that both broad quantitative trends and deep qualitative insights were captured. Particularly, a structured questionnaire was developed to assess students' note-taking habits, the frequency of PowerPoint use in their lectures, and their self-reported academic performance. The questionnaire was composed of both closed-ended and Likert scale questions, allowing for both specific responses and varied opinions. The questions covered several key themes, including:

- The frequency of PowerPoint use in lectures and the types of courses that utilized it
- The strategies used by students to take notes (e.g., verbatim transcription, summarization, paraphrasing)
- The challenges faced during PowerPoint-based lectures, such as slide complexity or the pace of lecture delivery
- Students' perceived understanding and retention of course content
- Self-reported academic performance (e.g., grades, course satisfaction)

The survey was distributed electronically to the sample of 80 students, providing easy access and allowing for a larger number of responses. A one-week period was allocated for survey completion, after which the data was collected and analysed.

For the qualitative data, semi-structured interviews and focus group discussions were conducted to provide more detailed insights into students' experiences with PowerPoint-based lectures. The qualitative methods allowed participants to express their challenges, frustrations, and strategies in their own words, offering a deeper understanding of the issues faced by students. Specifically, about 10-12 students participated in one-on-one interviews, each lasting between 30-45 minutes. The interviews were guided by a set of open-ended questions designed to explore the students' experiences with PowerPoint presentations, the strategies they used to take notes, and any challenges they faced during lectures. The interviews were recorded with the consent of the participants, ensuring that the data could be accurately transcribed and analysed. Further, a total of 3-4 focus group discussions were conducted, each consisting of 5-6 students. These discussions allowed for an interactive exchange of ideas, with students discussing common challenges, potential solutions, and their collective perceptions of PowerPoint-based learning. Focus group discussions provided a rich data source, as students could build on each other's ideas and share insights in a group setting.

Lastly, observations were conducted during a subset of PowerPoint-based lectures to capture real-time data on students' note-taking behaviours and engagement levels. These observations allowed the researchers to witness firsthand how students interacted with the PowerPoint presentations, how they took notes, and how the lecture delivery affected their engagement. The researchers took detailed field notes during these observations, noting any relevant behaviours and interactions between students and the lecturer. The observations were non-intrusive to minimize any disruption in the classroom.

### *3.5 Data Analysis*

The data collected from the surveys was analysed using descriptive statistics to identify patterns in students' note-taking behaviours and engagement levels. Measures such as frequencies and percentages were used to provide an overview of the data. The analysis was conducted using SPSS or R software.

The qualitative data from the interviews and focus groups were transcribed and analysed using thematic analysis. Thematic analysis involved identifying key themes and patterns in the data, coding the transcripts, and grouping similar responses. This process was facilitated by NVivo or Atlas.ti software, which allowed for efficient coding and organization of the data. Thematic analysis helped uncover recurring issues, such as the challenges of keeping up with the pace of PowerPoint lectures, the difficulty of capturing all the information presented, and the strategies used by students to overcome these challenges.

On the other hand, classroom observations were analysed using a descriptive approach, with the researchers noting key behaviours such as the speed at which students wrote, their interaction with the slides, and their level of engagement. These observations were then compared with the data from the surveys and interviews to identify any consistent patterns or discrepancies in student behaviour.

### *3.6 Ethical Considerations*

The study adhered to ethical guidelines to protect the rights and privacy of the participants. Informed consent was obtained from all students, who were fully informed about the study's purpose and procedures. Participants were assured that their

involvement was voluntary and that they could withdraw at any time without penalty. Data was anonymized to ensure confidentiality, and all responses were stored securely, in compliance with university policies. The study also respected the academic integrity of the participants by ensuring that their responses would not influence their academic standing.

### *3.7 Limitations*

The study had several limitations. The sample size, while sufficient for a detailed analysis, was limited to 80 students, which may not fully capture the diversity of experiences across the entire student body at Mukuba University. Additionally, the study was confined to first-year students, so the findings may not apply to students in later years of study. The reliance on self-reported data also introduced the potential for bias, as students may have provided socially desirable responses or misremembered their experiences. Despite these limitations, the combination of quantitative and qualitative methods allowed for a comprehensive understanding of the challenges and opportunities presented by PowerPoint-based learning environments.

## 4. Findings and Discussion

The following sections presents detailed findings on student engagement, challenges, impacts on learning, and strategies for improvement concerning PowerPoint-based lectures at Mukuba University. Verbatim quotes from students are included to balance appreciation and critique of the lecture approach.

### *4.1. Engagement with PowerPoint-Based Lectures in Note-Taking*

The study found that PowerPoint-based lectures shaped students' note-taking behaviours in distinct ways. Many students appreciated the organized nature of the slides, while others highlighted challenges in capturing meaningful information. Table 1 summarizes the note-taking preferences observed:

*Table 1: Student Note-Taking Preferences*

| Note-Taking Strategy | Percentage of Students (%) | Description |
|---|---|---|
| Jotting down key points from slides | 42 | Focused on capturing main ideas rather than detailed information |
| Photographing slides | 28 | Preferred to photograph slides rather than write notes |
| Comprehensive note-taking | 20 | Balanced between slide content and verbal lecture points |
| Minimal or no note-taking | 10 | Limited engagement with note-taking during lectures |

Many students reported that the structure of PowerPoint lectures facilitated quick identification of key concepts (42%). This is in line with the qualitative data. One student commented:

I like how PowerPoint slides summarize the content. It helps me focus on what's important without being overwhelmed by too much information. (FGDs, student)

However, others noted that relying solely on PowerPoint discouraged deeper engagement:

Sometimes I just copy the bullet points without really thinking about what they mean. It's like I'm on autopilot. (Interviews, student)

### 4.2. *Challenges Faced During Note-Taking*

Despite its benefits, students encountered several challenges during PowerPoint-based lectures. Table 2 presents key challenges reported:

*Table 2: Key Challenges in Note-Taking During PowerPoint-Based Lectures*

| Challenge | Percentage of Students (%) | Description |
|---|---|---|
| Fast pace of slide transitions | 54 | Slides changed too quickly, making it hard to capture information |
| Balancing listening and note-taking | 40 | Difficulty in listening and writing simultaneously |
| Inadequate slide content | 30 | Slides provided only headlines without enough details |
| Visibility issues | 18 | Poor projector quality and classroom seating issues |

The study demonstrated that most students (54%) were challenged by the fast pace of slide transitions. This validates qualitative data from the interviews and Focus Group Discussions. One student expressed frustration over the speed of slide changes:

The lecturer moves so quickly that I only manage to write half of what's on the slide before it changes. It's very stressful. (Interviews, student)

Another highlighted the difficulty of multitasking:

I have to choose between writing or listening. If I focus on one, I miss the other. (FGD, Student)

Yet, a few students found ways to adapt:

I started using my phone to take pictures of slides and then write detailed notes at home. It works for me. (Interviews, student)

### 4.3. *Impact of PowerPoint-Based Lectures on Note-Taking Skills*

The data indicated varying degrees of impact on students' note-taking skills. Table 3 summarizes the extent of this impact:

*Table 3: Impact on Note-Taking Skills*

| Level of Impact | Percentage of Students (%) | Description |
|---|---|---|
| Highly hindered | 38 | Passive copying of slides stifled critical note-taking skills |
| Moderately hindered | 35 | Partial development of effective note-taking skills |
| Minimal impact | 17 | Developed coping strategies for effective note-taking |
| No impact | 10 | Maintained effective note-taking skills regardless of lecture format |

Table 3 shows that majority of students (38%) felt were highly hindered by PowerPoint in terms of note taking skills. Similar findings were recorded in qualitative data. Some students reported feeling dependent on PowerPoint without engaging deeply:

I used to write detailed notes in high school, but now I just copy from the slides without much thought. I feel like my note-taking skills have declined. (Interviews, student)

However, others took a more positive view:

It depends on how you approach it. I take notes from the slides but also add the lecturer's explanations, which helps me understand better. (Interviews, student)

### *4.4. Strategies for Improvement*

Students suggested several strategies to enhance note-taking and engagement during PowerPoint-based lectures. Table 4 outlines these recommendations:

*Table 4: Recommended Strategies for Improvement*

| Strategy | Percentage of Students (%) | Description |
|---|---|---|
| Provide lecture outlines in advance | 38 | Helps students focus on understanding rather than copying slides |
| Slow down slide transitions | 32 | Allows students to capture key points and process information |
| Train students in note-taking techniques | 17 | Enhances ability to extract meaningful information from lectures |
| Incorporate interactive elements | 13 | Encourages active engagement and breaks the monotony of lectures |

Table 4 shows that majority of students (38%) recommended provision of lecture outlines, 32% slowing down transitions, 17% train students in note-taking, and 13% incorporation of interactive elements. The foregoing results were substantiated by qualitative data. One student emphasized the value of lecture outlines:

Having the slides or an outline in advance would really help. That way, I can come prepared and focus on understanding rather than just writing. (Interviews, student)

Another participant highlighted the need for interactive elements:

I learn better when there's a chance to ask questions or discuss concepts, not just sit and watch slides. (Interviews, Student)

## 5. Discussion

The findings from the study shed light on critical challenges encountered by first-year students when engaging with PowerPoint-based lectures, with a focus on cognitive overload, teacher-centered pedagogy, note-taking practices, and technology's role in learning. In contrast to traditional lecture models, the study's findings highlight how PowerPoint-based teaching practices can both hinder and, in some cases, enhance the learning experience. To critically examine these results, it is essential to engage with existing literature, highlighting both the strengths and weaknesses of PowerPoint as a pedagogical tool, along with the implications of note-taking, cognitive load, and technology on student learning outcomes.

### *5.1 The Cognitive Load of PowerPoint-Based Lectures*

The issue of cognitive overload observed in this study aligns with previous research on cognitive load theory (Sweller, 1988), which suggests that students are limited in their ability to process information when multiple sources of information are presented at once. The fast pace of PowerPoint slides combined with the lecture's verbal explanations forces students to divide their attention, leading to less effective learning (Chen et al., 2024). Cognitive overload is exacerbated when slides are dense and overloaded with information, preventing students from adequately processing and integrating material.

Several studies support the notion that cognitive overload is detrimental to learning outcomes. For instance, Kim (2018) emphasizes that access to slides alone does not guarantee better understanding or retention. Instead, the combination of slide accessibility and lecture pacing is pivotal. The lack of synchronization between verbal explanations and visual elements, a theme recurrent in this study, contributes to reduced comprehension and retention (Marsh & Sink, 2009). The study's findings demonstrate that, rather than promoting active engagement, dense slides often prompt students to adopt passive strategies such as simply transcribing content. This observation highlights the need for a more careful design of multimedia content that accommodates students' cognitive capacities and promotes deeper learning (Freeman et al., 2014).

### *5.2 Teacher-Centred Approach and Reduced Engagement*

The critique of the teacher-centred approach in PowerPoint-based lectures, as identified in this study, is grounded in the broader literature on student engagement. As noted by Freeman et al. (2014), passive learning environments, such as those fostered by teacher-dominant PowerPoint presentations, undermine student engagement, leading to shallow learning and poor retention. When students passively transcribe information from slides, the opportunity for active engagement is lost.

Bosanac and Vojčić (2024) highlight that note-taking in digital environments, often with a focus on speed rather than quality, reinforces passive engagement. Additionally, the study's observation that students focus on copying information rather than questioning or critically evaluating the content supports findings from Meer (2012), who argues that a lack of interactivity in traditional lecture-based teaching results in diminished critical thinking and deeper learning. Active learning strategies, such as group discussions, case-based problem-solving, and real-time feedback, have been shown to enhance learning outcomes, especially in STEM subjects (Freeman et al., 2014). These interactive approaches foster student engagement, critical reflection, and active knowledge construction, as opposed to the passive content reception that is often associated with PowerPoint slides. The results of this study therefore call for the reconfiguration of lecture structures to incorporate more student-centered learning strategies that actively involve students in the learning process.

### *5.3 The Need for Scaffolding in Note-Taking Practices*

One of the most critical insights provided by this study is the lack of scaffolding in students' note-taking practices. The results show that students defaulted to passive transcription-based note-taking, a strategy which has been shown to hinder deeper processing and retention of material (Mueller & Oppenheimer, 2014). This aligns with Morehead et al. (2019), who argue that students in the digital age often focus on taking "mechanical" notes—writing down content without engaging deeply with it. The study's findings indicate that, in the absence of explicit instruction on note-taking techniques, students are left to rely on superficial strategies such as verbatim copying.

This issue underscores the importance of note-taking instruction, which is essential for maximizing learning potential. Absent guidance on how to structure, summarize, or paraphrase material, students are deprived of tools that foster active engagement and promote deeper cognitive processing (Meer, 2012). Educational frameworks such as the Cornell Method or concept mapping could serve as effective scaffolding tools, encouraging students to synthesize and organize information more meaningfully (Flanigan & Titsworth, 2020). When properly guided, students can adopt note-taking strategies that enhance both their learning outcomes and retention rates (Palmatier & Bennett, 2016).

### *5.4 Technology as a Double-Edged Sword*

The study's critique of technology, particularly the use of smartphones and laptops for taking photographs of PowerPoint slides, reflects a broader concern within the literature about digital distractions in the classroom. As Flanigan and Titsworth (2020) discuss, the accessibility of technology in the classroom often shifts students' attention away from active engagement with the material. Taking photographs, while seemingly efficient, offers minimal cognitive benefits compared to traditional note-taking or even digital collaborative tools. This passive engagement with lecture content, as observed in the study, undermines the benefits of technology in learning.

However, it is essential to recognize that technology can also enhance learning outcomes if used purposefully. Platforms such as Google Docs, OneNote, and collaborative discussion boards enable students to share, review, and critique content, promoting deeper engagement with the material. Research by Abdulla and O'Sullivan (2019) supports this idea, showing that supplementing PowerPoint with detailed notes or supplementary multimedia can improve student performance and attendance. The key lies in leveraging technology as a tool that fosters collaboration and enhances student agency, rather than serving as a passive repository of lecture content.

### *5.5 Recommendations*

Building on the study's findings, several strategies can be proposed to improve student engagement and learning outcomes. First, the integration of active learning techniques, such as peer discussions, real-time problem-solving, and collaborative group work, can foster deeper engagement with content and improve retention (Freeman et al., 2014). The study's findings point to a clear need for instructors to move beyond traditional lecture methods, incorporating interactive components that engage students in constructing and applying knowledge. Second, as Chen et al. (2024) suggest, pacing lectures and designing slides that are not too fast or complex are crucial strategies for reducing cognitive overload. Slow-paced lectures that allow for breaks and time to process information can lead to better learning outcomes. Finally, instructors should make a concerted effort to incorporate explicit note-taking strategies into their pedagogy. Offering students tools for organizing information—whether through structured note-taking techniques or digital collaborative tools—would empower students to become more active participants in the learning process. By providing students with guidance on how to effectively organize and synthesize information, instructors can enable them to move from passive note-taking to more active engagement and critical thinking.

## 6. Conclusion

This critical analysis demonstrates that while PowerPoint is a widely used tool in education, its impact on student learning is contingent upon how it is integrated into the lecture environment. In conclusion, while PowerPoint-based lectures are a widely used and valuable tool in higher education, they present several challenges for student engagement and note-taking. The results of this study highlight issues related to cognitive overload, passive learning, and the need for scaffolding in note-taking. However, by incorporating active learning strategies, slowing the pace of lectures, providing note-taking guidance, and leveraging technology in a more structured way, instructors can enhance student engagement, improve note-taking practices, and ultimately support better learning outcomes. These recommendations are critical for maximizing the potential of PowerPoint presentations and ensuring that students can engage with the content in a meaningful way.

## References


Abdulla, M. H., & O'Sullivan, E. (2019). The impact of supplementing PowerPoint with detailed notes and explanatory videos on student attendance and performance in a physiology module in medicine. Medical Science Education, 29(4), 959-968. https://doi.org/10.1007/s40670-019-00780-8

Bosanac, M., & Vojčić, G. (2024). Taking notes during the teaching process in analogue and digital environments. Nastava i Vaspitanje. https://doi.org/10.5937/nasvas2402157b

Chen, A., Murphy, D., Brabec, J., Bjork, R., & Bjork, E. (2024). The effects of lecture speed and note-taking on memory for educational material. Applied Cognitive Psychology. https://doi.org/10.1002/acp.4166

Flanigan, A. E., & Titsworth, S. (2020). The impact of digital distraction on lecture note-taking and student learning. Instructional Science, 48, 495–524. https://doi.org/10.1007/s11251-020-09517-2

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., & Jordt, H. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences, 111(23), 8410–8415. https://doi.org/10.1073/pnas.1319030111

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences U.S.A., 111(23), 8410-8415. https://doi.org/10.1073/pnas.1319030111

Grant, N. K., & McGrath, A. L. (2023). Effects of PowerPoint slides on attendance and learning: If you share it, they will (still) come. Scholarship of Teaching and Learning in Psychology, 9(3), 346–351. https://doi.org/10.1037/stl0000241

Kim, H. (2018). Impact of slide-based lectures on undergraduate students' learning: Mixed effects of accessibility to slides, differences in note-taking, and memory term. Computers & Education, 123, 13–25. https://doi.org/10.1016/j.compedu.2018.04.004

Marsh, E., & Sink, H. (2009). Access to handouts of presentation slides during lecture: Consequences for learning. Applied Cognitive Psychology, 24, 691-706. https://doi.org/10.1002/ACP.1579

Meer, J. (2012). Students' note-taking challenges in the twenty-first century: Considerations for teachers and academic staff developers. Teaching in Higher Education, 17, 13-23. https://doi.org/10.1080/13562517.2011.590974

Morehead, K., Dunlosky, J., Rawson, K. A., Blasiman, R., & Hollis, R. B. (2019). Note-taking habits of 21st century college students: Implications for student learning, memory, and achievement. Memory, 27(6), 807-819. https://doi.org/10.1080/09658211.2019.1569694

Mueller, P. A., & Oppenheimer, D. M. (2014). The pen is mightier than the keyboard: Advantages of longhand over laptop note taking. Psychological Science, 25(6), 1159-1168. https://doi.org/10.1177/0956797614524581

Palmatier, R., & Bennett, J. (2016). Notetaking habits of college students. The Journal of Reading.

Williams, J., McCarley, N., Sharpe, J., & Johnson, C. (2017). The ability to discern relevant from irrelevant information on PowerPoint slides: A key ingredient to the efficacy of performance feedback. North American Journal of Psychology, 19, 219.

Zellhoefer, A., Murken, N., Hustedt, B., Clemens, A., & Walenski, D. (2010). Interactive effects of PowerPoint and note-taking as a function of lecture pace among UW-Eau Claire students. North American Journal of Psychology.