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Impact of the use of modern electronic gadgets in the students academic performance in university

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Topic of the thesis: Impact of the use of modern electronic gadgets in the students academic performance in university

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Declaration

I, Aruzhan Kutzhan, affirm that the dissertation entitled "Impact of the use of modern electronic gadgets in the students academic performance in university" is entirely my own work. This research was conducted under the guidance of Ualikhan Sadyk at Suleyman Demirel University. All sources of information, including text, data, figures, and concepts, have been appropriately acknowledged and referenced according to the academic standards established by Suleyman Demirel University.

I confirm that this dissertation has not been previously submitted, in whole or in part, for any other academic qualification or degree at any other institution. Any assistance received from others, such as technical support or research advice, has been duly acknowledged in the acknowledgments section.

I acknowledge the importance of academic honesty and integrity and accept full responsibility for upholding these principles in my work. Any form of plagiarism, data fabrication, or falsification would constitute a violation of these principles.

Aruzhan Kutzhan

June 2024

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Dedication

I dedicate this dissertation to my cherished family, whose constant support and motivation have been my guiding beacon during this academic voyage. Your enduring love, encouragement, and steadfast belief in my abilities have been the cornerstone of my strength and inspiration. This achievement is as much yours as it is mine. Thank you for standing beside me through every phase of this journey.

Abstract

This study explores the impact of electronic devices on university students' academic performance. The study uses a sample of 200 students from a university and examines the relationship between electronic device use and academic performance. The findings suggest that electronic device use during lectures and study time has a negative impact on academic performance, with laptops having a more negative impact than tablets or smartphones. The study has important implications for university students, educators, and policymakers, and provides recommendations for practice and policy to promote academic success. This study contributes to the growing body of literature on the impact of electronic devices on academic performance and highlights the need for further research to explore this relationship in different settings and with larger samples.

Keywords: electronic devices, statistical analysis, academic performance, data interpretation, hypothesis testing

Аңдатпа

Бұл зерттеу университет студенттерінің академиялық үлгеріміне электронды құрылғылардың әсерін зерттейді. Зерттеу университеттен 200 студенттен құралған үлгіні пайдаланып, электронды құрылғыларды пайдалану мен академиялық үлгерім арасындағы байланысты қарастырады. Нәтижелер электронды құрылғыларды лекциялар мен оқу уақытында пайдалану академиялық үлгерімге теріс әсер ететінін, ноутбуктер планшеттер немесе смартфондарға қарағанда көбірек теріс әсер ететінін көрсетеді. Зерттеу университет студенттері, оқытушылар және саясаткерлер үшін маңызды қорытындылар жасап, академиялық табысқа жетуге бағытталған ұсыныстар мен саясаттарды ұсынады. Бұл зерттеу электронды құрылғылардың академиялық үлгерімге әсері туралы өсіп келе жатқан әдебиетке үлес қосып, бұл байланысты әртүрлі жағдайларда және үлкенірек үлгілермен зерттеу қажеттілігін атап көрсетеді.

Кілт сөздер: электронды құрылғылар, статистикалық талдау, академиялық үлгерім, мәліметтерді интерпретациялау, гипотезаларды тексеру

Аннотация

Это исследование исследует влияние электронных устройств на академическую успеваемость студентов университета. В исследовании используется выборка из 200 студентов из университета, и оно изучает связь между использованием электронных устройств и академической успеваемостью. Результаты показывают, что использование электронных устройств во время лекций и учебного времени оказывает негативное влияние на академическую успеваемость, причем ноутбуки оказывают более негативное влияние, чем планшеты или смартфоны. Исследование имеет важные последствия для студентов университетов, преподавателей и политиков, и предоставляет рекомендации для практики и политики, направленные на повышение академической успеваемости. Это исследование вносит вклад в растущее количество литературы о влиянии электронных устройств на академическую успеваемость и подчеркивает необходимость дальнейших исследований для изучения этой связи в различных условиях и с большими выборками.

Ключевые слова: электронные устройства, статистический анализ, академическая успеваемость, интерпретация данных, проверка гипотез

Abbreviations

GPA - Grade Point Average

SDU - Suleyman Demirel University

ANOVA - Analysis of Variance

FGDs - Focus Group Discussions

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Chapter 1

Introduction

In the digital age, the use of electronic gadgets has become deeply ingrained in the educational experiences of university students. Modern devices such as smartphones, tablets, laptops, and smartwatches are now essential tools that facilitate various aspects of academic life [1]. These gadgets offer students access to a wealth of information and educational resources at their fingertips, enabling more efficient and effective learning practices[2]. The proliferation of these devices reflects a broader trend of digital transformation in education, where traditional learning methods are increasingly supplemented or replaced by technology-enhanced approaches[3].

The versatility of electronic gadgets is a significant factor in their widespread adoption. Smartphones and tablets, for instance, enable students to access e-books, academic journals, and online courses from virtually anywhere, transforming traditional study environments[4]. These devices also support a range of educational applications that aid in note-taking, organization, and interactive learning[5]. Laptops and desktop computers remain critical for more intensive academic tasks, such as writing research papers, conducting data analysis, and creating presentations[6].

The advent of high-speed internet and cloud computing has further enhanced the utility of these gadgets, allowing students to collaborate in real-time on group projects, participate in virtual classrooms, and engage with multimedia content that enriches their understanding of complex subjects[7]. Additionally, wearable devices like smartwatches and fitness trackers contribute to students' overall well-being by promoting time management, physical activity, and stress reduction, which can indirectly support academic performance [8]. These devices also offer functionalities that help students track their study schedules, set reminders for assignments, and maintain a balanced lifestyle, all of which can contribute to improved academic outcomes [9].

Impact on Academic Performance. The impact of electronic gadgets on academic performance is multifaceted and varies depending on how these devices are utilized. Proponents of technology integration in education argue that electronic gadgets can significantly enhance learning outcomes by providing interactive and engaging educational experiences. For example, educational apps and

software can offer personalized learning paths tailored to individual student needs, enabling them to progress at their own pace and focus on areas where they need improvement[10]. Interactive features such as quizzes, simulations, and gamified learning modules can make the learning process more engaging and effective, helping students retain information better[11]. Moreover, electronic gadgets facilitate communication and collaboration among students and educators. Enable students to share knowledge, seek help, and work together on assignments, fostering a collaborative learning environment[12]. Video conferencing tools also allow for virtual office hours and remote tutoring, making it easier for students to access academic support outside of traditional classroom settings[13]. This enhanced connectivity can lead to a more supportive and inclusive educational experience, where students feel more connected to their peers and instructors[14].

Examples of Positive Impacts.

1. Enhanced Learning: Educational apps like Khan Academy and Duolingo provide interactive and engaging content that can enhance students' learning experiences.

2. Collaborative Projects: Tools like Google Docs and Microsoft Teams facilitate real-time collaboration on group projects, enabling students to work together more effectively.

3. Access to Resources: Online libraries and academic databases make it easier for students to access a wide range of scholarly resources, supporting independent research and study.

Challenges and Drawbacks. Despite these benefits, there are notable challenges associated with the use of electronic gadgets in academic settings. One of the primary concerns is the potential for distraction. The allure of social media, gaming, and other non-academic content can significantly detract from study time and focus, leading to procrastination and reduced academic productivity [15]. The constant connectivity provided by these devices can also contribute to information overload and digital fatigue, which may negatively impact students' mental health and overall academic performance [16].

Another critical issue is the disparity in access to and proficiency with electronic gadgets. Students from lower socio-economic backgrounds may face barriers to acquiring the latest devices or maintaining reliable internet access, leading to a digital divide that can exacerbate educational inequalities [17]. Additionally, not all students possess the digital literacy skills necessary to effectively use these technologies for academic purposes, which can hinder their ability to fully benefit from the available resources. This disparity can result in significant differences in academic performance, with students who have better access to and proficiency with technology potentially outperforming their peers[18].

Health Concerns. Prolonged use of electronic gadgets can lead to health issues such as eye strain, poor posture, and sleep disturbances. The blue light emitted by screens can disrupt sleep patterns, while prolonged sitting and improper ergonomics can cause musculoskeletal problems [19]. These health concerns can negatively impact students' overall well-being and academic performance. For in-

stance, students who experience poor sleep quality due to excessive screen time may find it difficult to concentrate and perform well in their studies [20].

Dependency and Overreliance. The convenience and accessibility of electronic gadgets can lead to overreliance on these devices. Students may become dependent on technology for note-taking, calculations, and information retrieval, potentially diminishing their critical thinking and problem-solving skills [21]. Additionally, the constant availability of information can reduce the incentive to develop independent research and study skills. Overreliance on technology can also impact students' ability to engage in deep learning, where critical analysis and synthesis of information are essential [22].

Examples of Negative Impacts.

1. Distractions: Constant notifications from social media apps can interrupt study sessions, reducing students' ability to focus on their academic tasks.
2. Health Issues: Excessive screen time can lead to eye strain and sleep disturbances, which can negatively affect students' overall health and academic performance.
3. Digital Divide: Students from lower socio-economic backgrounds may have limited access to the latest technology, impacting their ability to engage fully in digital learning.

1.1 Research Objectives

The aims of this research are to provide a comprehensive analysis of the impact of modern electronic gadgets on the academic performance of university students. The specific objectives of this research include:

1. **To examine the relationship between electronic device usage and academic performance.**
    - This objective aims to explore how the use of different electronic gadgets influences students' grades, retention of information, and overall academic success. By understanding this relationship, the study seeks to identify patterns of device usage that are associated with positive or negative academic outcomes.
2. **To identify potential differences in the impact of various types of electronic devices on academic success.**
    - This objective will investigate whether certain devices, such as laptops, tablets, or smartphones, have a more significant impact on academic performance. It will also explore how different functionalities and applications of these devices contribute to learning.
3. **To explore the role of factors such as frequency and duration of device usage in relation to academic performance.**
    - This objective will examine how often and for how long students use

electronic gadgets for academic purposes. It will assess whether higher frequency and longer duration of usage correlate with better or worse academic performance.

4. **To assess students' perceptions and attitudes towards the use of electronic devices for academic purposes.**
    - This objective aims to gather students' views on how electronic gadgets impact their learning. It will explore their perceptions of the benefits and drawbacks of using these devices, as well as their overall attitudes towards technology in education.

1.2 Research Questions

The research questions for this dissertation are formulated to explore the multifaceted impact of modern electronic gadgets on the academic performance of university students. These questions aim to address both the positive and negative aspects of gadget usage, as well as the influence of external factors such as digital literacy and socio-economic status. The following research questions will guide the study:

1. **To what extent are modern electronic gadgets integrated into the daily academic routines of university students?**
    - This question seeks to understand how frequently and in what ways students use electronic gadgets for academic purposes. It will examine the types of gadgets commonly used, the purposes for which they are employed (e.g., research, note-taking, communication), and the frequency of their use.
2. **What are the perceived benefits of using modern electronic gadgets in academic settings from the students' perspective?**
    - This question aims to identify the advantages students associate with using electronic gadgets. It will explore how these devices enhance learning experiences, improve study efficiency, facilitate access to information, and support collaborative work.
3. **What are the potential negative impacts of modern electronic gadgets on students' academic performance?**
    - This question focuses on identifying the drawbacks and challenges associated with gadget usage. It will investigate issues such as distractions, overreliance on technology, health concerns, and the potential for reduced academic productivity.
4. **How does the use of modern electronic gadgets affect students' study habits and time management?**
    - This question examines the relationship between gadget usage and students' study behaviors. It will assess whether the availability of these

devices leads to better-organized study schedules, increased procrastination, or changes in time management strategies.

5. **What is the relationship between electronic device use and university students' academic performance?**
    - This question aims to establish a direct correlation between the usage of electronic gadgets and the academic outcomes of university students. It will assess how different levels and types of device usage impact grades, retention of information, and overall academic success.
6. **What are the perceived positive and negative effects of electronic gadget usage on students' study habits, time management, and overall academic discipline?**
    - This question seeks to gather students' perceptions regarding how electronic gadgets influence their study routines, ability to manage time effectively, and maintain academic discipline. It will explore both the benefits, such as improved organization and access to resources, and the drawbacks, such as distractions and procrastination.

1.3 Relevance of the Study

The relevance of this study lies in its potential to contribute valuable insights into the evolving relationship between technology and education, specifically focusing on the use of modern electronic gadgets and their impact on the academic performance of university students. Understanding this relationship is crucial for several reasons:

1.3.1 Informing Educational Practices and Policies

As electronic gadgets become increasingly integrated into educational settings, it is essential for educators and policymakers to understand their effects on academic performance. This study provides empirical evidence on how these devices are used by students and the outcomes associated with their use[23]. The findings can inform the development of guidelines and best practices for the effective integration of technology in educational environments, ensuring that the benefits are maximized while minimizing potential drawbacks .

1.3.2 Enhancing Student Learning Experiences

By identifying the positive impacts of electronic gadgets on learning outcomes, this research highlights ways in which these devices can be leveraged to enhance student engagement, comprehension, and retention of information. Understanding how gadgets facilitate interactive and personalized learning experiences can help educators design more effective teaching strategies that cater to diverse learning styles and needs.

1.3.3 Addressing Challenges and Mitigating Negative Impacts

The study also sheds light on the challenges and negative impacts associated with the use of electronic gadgets, such as distractions, overreliance on technology, and health concerns [24]. By recognizing these issues, educators and students can develop strategies to mitigate their effects, such as implementing time management techniques, setting boundaries for gadget use, and promoting digital wellness. Addressing these challenges is crucial for maintaining a balanced and healthy academic environment.

1.3.4 Bridging the Digital Divide

Socio-economic disparities in access to electronic gadgets and internet connectivity can exacerbate educational inequalities. This research explores the extent of the digital divide and its impact on academic performance, providing insights into how socio-economic factors influence students' ability to benefit from technology [25]. The findings can guide policymakers in developing initiatives to bridge the digital divide, ensuring that all students have equitable access to the technological resources they need to succeed academically.

1.3.5 Promoting Digital Literacy

Digital literacy is a critical skill in the modern educational landscape. This study examines the role of digital literacy in effectively utilizing electronic gadgets for academic purposes. By highlighting the importance of digital proficiency, the research underscores the need for educational institutions to incorporate digital literacy training into their curricula. Enhancing students' digital literacy skills can empower them to use technology more effectively, improving their academic performance and preparing them for the demands of the digital age.

1.3.6 Supporting Evidence-Based Decision Making

The insights gained from this research provide a robust evidence base that can support decision-making processes in educational settings. Educators, administrators, and policymakers can use the findings to make informed choices about technology integration, resource allocation, and the development of support systems for students. Evidence-based decisions ensure that interventions and policies are grounded in empirical data, leading to more effective and sustainable outcomes.

1.3.7 Contributing to the Academic Discourse

This study adds to the growing body of literature on the impact of technology in education. By providing a comprehensive analysis of the effects of electronic gadgets on academic performance, the research contributes to the academic discourse on educational technology. The findings can serve as a reference point for future studies, facilitating ongoing research and discussion in this critical area.

1.3.8 Empowering Students

Ultimately, understanding the impact of electronic gadgets on academic performance empowers students to make informed decisions about their technology use. By recognizing the potential benefits and drawbacks, students can adopt practices that enhance their learning and academic success. The research promotes a balanced approach to technology use, encouraging students to harness the power of electronic gadgets while maintaining focus and well-being.

The research highlights the importance of a balanced approach to technology use, encouraging students to harness the power of electronic gadgets while maintaining focus and well-being. This balanced approach involves setting clear boundaries for device usage, prioritizing academic tasks, and utilizing digital tools that specifically support educational goals.

This study is significant because it provides comprehensive insights into the complex relationship between modern electronic gadgets and academic performance. The findings have practical implications for educators, policymakers, and students, offering evidence-based guidance for optimizing technology use in educational settings. By addressing key challenges and promoting best practices, the research contributes to the advancement of education in the digital age.

The adoption of electronic gadgets is driven by their versatility and the convenience they offer. Smartphones and tablets, for instance, provide students with on-the-go access to educational content, online courses, e-books, and academic databases. Laptops and desktops serve as essential tools for conducting research, completing assignments, and participating in online classes. Additionally, wearable devices like smartwatches offer functionalities that support time management and health monitoring, which can indirectly influence academic performance.

Despite the apparent benefits, the impact of these gadgets on academic performance remains a subject of considerable debate. Proponents argue that electronic gadgets enhance learning by providing interactive and engaging educational experiences, facilitating communication and collaboration, and enabling personalized learning through various applications and software. Conversely, critics highlight potential drawbacks, such as distractions caused by social media, games, and non-academic content, which can detract from study time and focus.

Moreover, the dependency on electronic gadgets raises concerns about digital literacy and the ability of students to effectively use these technologies for academic purposes. The disparity in access to and proficiency with these devices also poses challenges, potentially exacerbating educational inequalities among students from different socio-economic backgrounds.

This dissertation seeks to explore the multifaceted impact of modern electronic gadgets on the academic performance of university students. By examining both the positive and negative aspects, this study aims to provide a comprehensive understanding of how these devices influence learning outcomes, study habits, and overall academic success. Through a combination of literature review, empirical research, and data analysis, this research will contribute to the ongoing discourse on the role of technology in higher education and inform strategies for optimizing its use to enhance student learning and achievement.

Object of Research. The object of this research is university students from

diverse academic disciplines and backgrounds who utilize electronic devices as part of their learning experience.

Research Methods. This study will employ a mixed-methods approach, incorporating both quantitative and qualitative methodologies. Quantitative data will be collected through surveys and academic performance metrics, while qualitative insights will be gathered through interviews and focus groups.

Scientific Novelty of the Work. This dissertation contributes to the existing body of literature by providing a comprehensive comparative analysis of the impact of electronic devices on university students' academic performance. By integrating quantitative and qualitative methodologies, this research offers nuanced insights into the complex relationship between technology use and academic success.

The following scientific statements are to be defined:

- The extent to which electronic device usage correlates with academic performance.

- Variations in the impact of different types of electronic devices on academic success.

- Factors influencing the relationship between electronic device usage and academic performance.

- Perceptions and attitudes of university students towards electronic device usage for academic purposes.

The practical significance of the research results. The findings of this research will inform educational stakeholders about the implications of electronic device usage on student learning and performance. These insights can guide the development of evidence-based strategies and policies to support effective integration of technology in educational settings, ultimately enhancing student outcomes and academic success.

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Chapter 2

Literature review

2.1 Theoretical Framework

To understand the impact of modern electronic gadgets on academic performance, it is essential to explore relevant theoretical frameworks that provide insights into how technology affects learning and behavior. These frameworks help contextualize the findings and offer a deeper understanding of the mechanisms through which electronic devices influence educational outcomes. By grounding the study in established theories, researchers can better interpret the data and develop strategies that leverage the benefits of technology while mitigating its potential drawbacks. The integration of theoretical perspectives ensures a comprehensive approach to analyzing the complex interactions between technology use and academic performance. This thorough examination is crucial for formulating effective educational policies and interventions that can enhance learning experiences while addressing potential challenges associated with electronic gadget usage.

Two key theories are particularly relevant to this study: Cognitive Load Theory (CLT) and the Technology Acceptance Model (TAM).

Cognitive Load Theory: Developed by John Sweller [26], Cognitive Load Theory posits that the human brain has a limited capacity for processing information. Cognitive load is divided into intrinsic, extraneous, and germane loads. Intrinsic load pertains to the inherent difficulty of the material, extraneous load involves unnecessary distractions, and germane load relates to the processing that facilitates learning. Electronic gadgets can both alleviate and exacerbate cognitive load. On one hand, they provide tools that simplify complex tasks and enhance understanding, thereby reducing intrinsic load. On the other hand, they can introduce distractions, increasing extraneous load, and potentially impeding learning. For instance, a student using a tablet for interactive learning apps might benefit from reduced intrinsic load due to the simplified presentation of complex concepts. However, the same tablet can increase extraneous load if notifications from social media apps distract the student. Understanding these dynamics is essential for developing strategies that maximize the educational benefits of electronic gadgets while minimizing their potential to disrupt learning.

Technology Acceptance Model (TAM): Proposed by Fred Davis [27], the

Technology Acceptance Model explores how users come to accept and use technology. The model suggests that perceived ease of use and perceived usefulness are the primary factors influencing individuals' attitudes toward technology and their subsequent usage behavior. In the context of academic performance, students' perceptions of how easy and useful gadgets are for their studies can significantly impact their engagement with these devices and their overall academic outcomes. For example, if students find a particular educational app easy to use and helpful in their studies, they are more likely to incorporate it into their learning routines, thereby potentially enhancing their academic performance. This model underscores the importance of designing educational technologies that are both user-friendly and beneficial, encouraging widespread adoption and effective use. By focusing on these factors, educators and developers can create tools that not only attract students but also support their academic success.

These theories provide a robust framework for analyzing the dual impact of electronic gadgets, offering valuable insights into promoting effective and balanced technology use in educational settings. By applying these theoretical insights, educators can develop targeted interventions that optimize the educational benefits of electronic devices while reducing their potential adverse effects on students' cognitive and academic performance.

2.2 Previous Studies

Smartphone Use and Academic Performance: A Pervasiveness Approach Beyond Addiction (2021) - G. Tiziano, G. Marco, and B. Moritz

- **Methods:** Quantitative and qualitative analysis
- **Advantages:** Ensures findings are representative and reliable; robust dataset combining self-reported behaviors and objective academic performance metrics; applicable across diverse subgroups.
- **Disadvantages:** Self-reported data can introduce biases; limited ability to draw causal connections; unmeasured factors could affect outcomes.

This study highlights the pervasive nature of smartphone use among students and its complex relationship with academic performance. It underscores the importance of considering both the depth and breadth of smartphone engagement. While the study provides valuable insights into the correlations between smartphone use and academic outcomes, the reliance on self-reported data remains a significant limitation. Self-reported data are susceptible to various biases, such as social desirability bias, where respondents may underreport negative behaviors or overreport positive ones to conform to perceived social norms. Furthermore, the study's cross-sectional design limits its ability to establish causal relationships, leaving open questions about whether increased smartphone use leads to poorer academic performance or if students struggling academically are more likely to seek distraction through their devices [28].

The Relationship Between Frequency of Facebook Use, Participation in Facebook Activities, and Student Engagement (2011) - R. Junco

- **Methods:** Descriptive statistics, hierarchical regression analysis
- **Advantages:** Established instruments enhance credibility; detailed analysis of specific Facebook activities; hierarchical regression clarifies dynamics affecting student engagement.
- **Disadvantages:** Self-reported measures can introduce biases; difficult to determine direction of influence; limited response rate may not represent entire student body.

Junco's study offers a detailed examination of how specific Facebook activities correlate with student engagement. By using established instruments like the National Survey of Student Engagement (NSSE), the study gains credibility and allows for comparisons across different educational contexts. However, the reliance on self-reported data introduces potential biases that could affect the accuracy of the findings. Additionally, the study's design does not allow for causal inferences, making it challenging to determine whether Facebook use enhances engagement or if more engaged students are simply more active on Facebook. The relatively low response rate further complicates the generalizability of the results, as it may not adequately reflect the behaviors of the broader student population.[29]

The Impact of Mobile Phone Usage on Student Learning (2013) - Jeffrey H. Kuznekoff & S. Titsworth

- **Methods:** Experimental design with quantitative data analysis
- **Advantages:** Controlled setting enables clear comparisons; immediate testing after lectures measures distraction effects; frequency variations provide nuanced understanding.
- **Disadvantages:** Laboratory environment may not reflect real classroom settings; focus on mobile phone distractions may overlook other factors; reliance on self-reported data can introduce biases.

Kuznekoff and Titsworth's experimental study provides a clear and controlled examination of mobile phone distractions during lectures. By testing students immediately after lectures, the study offers precise measurements of the impacts of distractions on learning outcomes. However, the laboratory setting may not accurately reflect the complexities of real classroom environments, potentially limiting the applicability of the findings. The study's narrow focus on mobile phone distractions also means it might overlook other significant factors influencing student learning, such as overall study habits or classroom engagement levels. Despite these limitations, the study's findings underscore the significant negative impact of mobile phone distractions on student learning, highlighting the need for strategies to manage device use in educational settings [30].

Internet Use and Academic Performance: An Interval Approach (2022) - Maria L. de Guevara, Luis A. Lopez-Agudo, Claudia P. Latorre, Oscar D. Marcenaro-Gutierrez

- **Methods:** Statistical data analysis, programming for uncertainty analysis

- **Advantages:** OLS regression provides reliable statistical foundation; interval multiobjective programming accounts for data uncertainty.
- **Disadvantages:** Complex statistical methods require significant expertise; OLS models require specific assumptions which can restrict findings.

This study employs advanced statistical methods to assess the impact of internet use on academic performance. The use of Ordinary Least Squares (OLS) regression provides a solid statistical foundation, while interval multiobjective programming accounts for the inherent uncertainty in the data. These sophisticated techniques enhance the robustness of the findings. However, the complexity of these methods requires significant expertise to interpret correctly, which may limit their accessibility to a broader audience. Additionally, the reliance on OLS models necessitates specific assumptions about the data, which can restrict the generalizability of the findings if these assumptions are not met [31].

The Effects of Smartphone Addiction on Learning: A Meta-Analysis (2021) - Oluwafemi J. Sunday, Olusola O. Adesope, Patricia L. Maarhuis

- **Methods:** Quantitative meta-analysis
- **Advantages:** Combines multiple studies for robust overview; standardized effect size measures and software enhance precision; structured protocol improves reproducibility.
- **Disadvantages:** Variability in study designs and populations affects interpretation; potential bias due to non-publication of non-significant results; strict inclusion criteria may exclude relevant studies.

Sunday et al.'s meta-analysis offers a comprehensive overview of the effects of smartphone addiction on learning by combining data from multiple studies. The use of standardized effect size measures and sophisticated software ensures precise analysis and enhances the robustness of the conclusions. However, the variability in the designs and populations of the included studies can complicate the interpretation of the results, as the differences in methodologies and contexts may affect the overall findings. Moreover, the potential for publication bias, where studies with non-significant results are less likely to be published, can skew the results. The strict inclusion criteria, while ensuring high-quality data, might also exclude relevant studies, potentially omitting valuable insights [32].

The Effect of Digital Device Usage on Student Academic Performance: A Case Study (2021) - Maria Limniou

- **Methods:** Quantitative statistical analysis
- **Advantages:** Extensive data from numerous participants; broad perspective from students of various academic years; combined numerical ratings and personal narratives for depth.
- **Disadvantages:** Findings may not apply universally; self-reported responses can be inaccurate; snapshot design hinders long-term trend inference.

Limniou's case study provides a comprehensive view of digital device usage

across different academic years. The use of both online and paper-based questionnaires allows for extensive data collection, and the combination of numerical ratings and personal narratives offers a deep and nuanced understanding of the impact of digital devices. However, the study's findings are limited to one academic department at a single university, which may not apply universally to other contexts. The reliance on self-reported data introduces potential inaccuracies, as respondents may misreport their behaviors. Additionally, the snapshot design captures data at a single point in time, limiting the ability to infer long-term trends or causal relationships.[33]

The Relationship Between Cell Phone Use and Academic Performance in a Sample of U.S. College Students (2015) - Andrew Lepp, Jacob E. Barkley, Aryn C. Karpinski

- **Methods:** Hierarchical multiple regression
- **Advantages:** Detailed control over variables isolates specific impacts; accurate GPA data from university records; systematic analysis approach.
- **Disadvantages:** Self-reported cell phone usage introduces potential inaccuracies; one-time data collection limits causality determination; single university sample may not represent other populations.

Lepp et al.'s study utilizes hierarchical multiple regression to isolate the specific impact of cell phone use on academic performance. The use of accurate GPA data from university records ensures reliable measures of academic performance, and the systematic approach to analyzing multiple variables provides detailed insights. However, the reliance on self-reported cell phone usage introduces potential inaccuracies, as students may not accurately recall their usage patterns. The one-time data collection limits the ability to determine causality or track changes over time. Moreover, the findings from a single university sample may not be representative of other student populations or educational settings.[34]

The Effect of Mobile Phone Usage Policy on College Students' Learning (2021) - Evren Sumuer

- **Methods:** Mixed analysis of variance (ANOVA)
- **Advantages:** Quasi-experimental design with pretest and posttest; well-defined treatment conditions aid replication; comprehensive analysis of policy influence over time.
- **Disadvantages:** Use of pre-existing groups without random assignment may lead to uncontrolled differences; findings may not apply outside specific contexts; self-regulated phone use introduces variability.

Sumuer's study investigates the impact of mobile phone usage policies on college students' learning outcomes using a quasi-experimental design. The pretest and posttest structure provides a controlled framework to examine changes over time, and the mixed ANOVA enables a comprehensive analysis of how policy changes influence learning. However, the use of pre-existing groups without random assignment introduces potential uncontrolled differences that could affect the

results. The findings may not generalize beyond the specific academic and cultural context of the study, and self-regulated phone use in the unrestricted group adds variability to the treatment conditions.[35]

2.3 Gaps in Literature

While existing research provides valuable insights into the impact of electronic gadgets on academic performance, several gaps remain:

1. **Comprehensive Analysis:** Many studies focus on specific aspects of gadget usage, such as the impact of a single type of device or the effects on a particular subject area. A comprehensive analysis that examines the overall impact of various electronic gadgets on academic performance across different disciplines is needed. This would provide a holistic understanding of how these devices affect learning and academic outcomes.

2. **Longitudinal Studies:** Most research to date has been cross-sectional, providing a snapshot of gadget usage and its effects at a single point in time. Longitudinal studies that track students' use of electronic gadgets and their academic performance over an extended period would offer deeper insights into long-term impacts. Such studies would help determine whether the observed effects persist, diminish, or intensify over time.

3. **Digital Literacy:** There is limited research on the role of digital literacy in mediating the effects of electronic gadget usage. Understanding how digital literacy skills influence students' ability to effectively use technology for academic purposes can help in developing targeted educational interventions. Research in this area could explore how training in digital literacy affects students' academic performance and their ability to use electronic gadgets efficiently.

4. **Balanced View:** While some studies emphasize the positive aspects of gadget usage, others focus on the negatives. Few studies provide a balanced view that considers both the benefits and challenges, offering a nuanced understanding of the overall impact of these devices on academic performance. A balanced approach would help in formulating strategies that maximize benefits while mitigating drawbacks.

5. **Contextual Factors:** The influence of contextual factors such as cultural differences, institutional policies, and individual student characteristics on the relationship between gadget usage and academic performance is underexplored. More research is needed to understand how these factors interact with technology use. For example, cultural attitudes towards technology, institutional support for digital learning, and individual differences in learning styles could all play significant roles in shaping the impact of electronic gadgets on academic outcomes.

6. **Intervention Studies:** Few studies have explored interventions designed to optimize the use of electronic gadgets for academic purposes. Research in

this area could test the effectiveness of various strategies, such as time management training, digital wellness programs, and policies regulating gadget use in classrooms. Intervention studies could provide practical recommendations for educators and policymakers aiming to enhance the positive impacts of technology while reducing its negative effects.

2.4 Literature Synthesis

To synthesize the findings from previous studies, it is essential to consider both the positive and negative impacts of electronic gadgets on academic performance, as well as the role of mediating factors such as digital literacy and socio-economic status.

Positive Impacts:

- **Enhanced Learning Experiences:** Studies such as those by Sung, Chang, and Liu[36] (2016) and Kinash, Brand, and Mathew[37] (2012) have highlighted the potential of electronic gadgets to enhance interactive and personalized learning experiences. Educational apps and software can cater to diverse learning styles, making learning more engaging and effective.
- **Improved Accessibility:** The accessibility of educational resources through electronic gadgets allows students to conduct research and access information more efficiently. Online libraries and academic databases expand the scope of available resources, supporting independent learning and research.
- **Collaborative Learning:** The facilitation of communication and collaboration through electronic gadgets is another significant benefit. Platforms like Google Drive, Microsoft Teams, and various messaging apps enable students to work together on projects, share knowledge, and receive feedback in real-time, fostering a collaborative learning environment.

Negative Impacts:

- **Distractions and Reduced Focus:** Research by Rosen, Carrier, and Cheever[38] (2013) and Kuznekoff and Titsworth[30] (2013) has shown that electronic gadgets can be significant sources of distraction. Notifications from social media, games, and other non-academic apps can divert students' attention from their studies, leading to reduced academic productivity.
- **Health Concerns:** Prolonged use of electronic gadgets can lead to physical health issues such as eye strain, poor posture, and sleep disturbances, as highlighted by Lemola et al. (2015)[39]. These health concerns can negatively impact students' overall well-being and academic performance.
- **Digital Divide:** The digital divide, as discussed by Selwyn (2004)[40], poses a significant challenge. Socio-economic disparities in access to electronic gadgets and reliable internet connections can exacerbate educational inequalities, with students from lower-income backgrounds facing barriers to acquiring and effectively using these devices.

Mediating Factors:

- **Digital Literacy:** The role of digital literacy in mediating the effects of electronic gadget usage is critical. Students with higher levels of digital proficiency are better able to leverage these devices for academic purposes, enhancing their learning outcomes. Research is needed to explore how digital literacy training can improve students' ability to use technology effectively.
- **Socio-Economic Status:** Socio-economic factors influence students' access to and use of electronic gadgets. Understanding how these factors impact academic performance can help in developing initiatives to bridge the digital divide and ensure equitable access to technology.

Intervention Strategies:

- **Time Management Training:** Teaching students effective time management strategies can help them balance the use of electronic gadgets with their academic responsibilities. Interventions that focus on setting boundaries for gadget use and prioritizing academic tasks can reduce the negative impacts of distractions.
- **Digital Wellness Programs:** Programs that promote digital wellness can help students manage the physical and mental health effects of prolonged gadget use. These programs can include guidelines for healthy screen time, ergonomic practices, and strategies to minimize digital distractions.
- **Classroom Policies:** Implementing policies that regulate the use of electronic gadgets in classrooms can help mitigate their negative impacts. For example, policies that restrict the use of mobile phones during lectures can reduce distractions and improve students' focus on the material being taught.

The literature review highlights the complex and multifaceted impact of modern electronic gadgets on academic performance. While these devices offer significant benefits in terms of enhanced learning experiences, improved accessibility, and collaborative opportunities, they also pose challenges related to distractions, health concerns, and socio-economic disparities. Enhanced learning experiences come from interactive apps and online resources that cater to diverse learning styles, making education more engaging and accessible.

However, the constant connectivity and plethora of applications available on these devices can lead to significant distractions. Social media, games, and other non-academic activities can compete for students' attention, causing procrastination and diminished focus on studies. Managing these distractions is crucial for optimizing the benefits of electronic gadgets, emphasizing the need for strong time management and self-regulation skills.

Health concerns are another critical aspect highlighted in the literature. Prolonged use of electronic gadgets can lead to physical issues such as eye strain, poor posture, and sleep disturbances. These health problems can indirectly impact academic performance by affecting overall well-being and concentration. Promoting digital wellness practices, such as taking regular breaks, using ergonomic setups, and limiting screen time, is essential to mitigate these risks.

Socio-economic disparities further complicate the impact of electronic gadgets on academic performance. Students from lower socio-economic backgrounds may lack access to the latest devices or reliable internet connections, exacerbating educational inequalities. The digital divide can prevent these students from fully benefiting from the educational resources that electronic gadgets offer. Addressing these disparities through targeted interventions and support programs is vital for ensuring equitable access to technology and fostering inclusive educational environments.

By addressing the gaps in the current research and exploring the role of mediating factors, this study aims to provide a comprehensive understanding of how electronic gadgets influence university students' academic performance. Key areas for further investigation include the long-term effects of device usage, the differential impact of various types of devices, and the role of digital literacy in maximizing the benefits of technology. Understanding these nuances is crucial for developing effective strategies to support students in their use of electronic gadgets.

The findings will inform the development of evidence-based strategies to optimize technology use in educational settings. By providing empirical data on the benefits and challenges of electronic gadgets, this research will guide educators and policymakers in creating policies and practices that leverage technology for positive educational outcomes. Implementing digital literacy programs and promoting digital wellness can equip students with the skills needed to navigate the digital landscape effectively and healthily.

Ultimately, this study aims to contribute to the advancement of education in the digital age. By offering a balanced perspective on the impact of electronic gadgets, the research will highlight the potential for technology to enhance learning while also addressing the challenges associated with its widespread use. The goal is to create an educational environment where technology serves as a tool for empowerment and growth, rather than a source of distraction and disparity. Through a comprehensive understanding of the complex dynamics at play, this study will pave the way for more informed and effective integration of electronic gadgets in higher education, ensuring that all students can benefit from the opportunities they offer.

In conclusion, the literature review reveals the dual nature of electronic gadgets in education, presenting both opportunities and challenges. The nuanced understanding gained from this research will enable the development of targeted interventions that maximize the positive impacts while mitigating the negative ones. By bridging the gaps in the current literature and providing a holistic view of technology's role in academic performance, this study will significantly contribute to the field of educational technology and support the ongoing evolution of teaching and learning practices in the digital era.

Chapter 3

Methodology

This dissertation employs both quantitative and qualitative research methods to provide a comprehensive analysis of the impact of modern electronic gadgets on the academic performance of university students. The following sections outline the steps taken to conduct the research:

1. **Data Collection:**
    - **Quantitative Data:** Surveys and academic performance metrics are collected from a diverse group of university students. The surveys include questions on the frequency, duration, and types of electronic gadget usage, as well as self-reported academic performance indicators such as grades and study habits.
    - **Qualitative Data:** In-depth interviews and focus groups are conducted with a subset of students to gather detailed insights into their experiences and perceptions regarding electronic gadget usage. These qualitative methods allow for a richer understanding of the context and nuances that quantitative data alone might miss.
2. **Data Analysis:**
    - **Quantitative Analysis:** The collected survey data are analyzed using statistical methods. Descriptive statistics provide an overview of the data, while inferential statistics, including correlation and regression analysis, are used to identify relationships between gadget usage and academic performance.
    - **Qualitative Analysis:** The interview and focus group transcripts are analyzed using thematic analysis. This involves coding the data to identify recurring themes and patterns that shed light on the students' experiences and attitudes towards electronic gadgets in their academic lives.
3. **Time Consumption Analysis:** This step involves evaluating how much time students spend using electronic gadgets for academic purposes versus

non-academic purposes. By highlighting areas where time consumption is inefficient, the research aims to identify potential distractions and their impact on academic performance.

4. **Root Cause Analysis:** Investigating the underlying causes contributing to significant time consumption or inefficiencies in gadget usage. This involves looking into factors such as the nature of distractions, the usability of educational apps, and students' time management skills.

5. **Solutions and Recommendations:** Based on the findings from the data analysis and root cause investigation, actionable solutions are proposed to optimize the efficiency and effectiveness of electronic gadget usage. These recommendations aim to enhance academic performance by promoting best practices for gadget use and addressing identified challenges.

The following sections will describe these steps in detail.

3.1 Data Collection

3.1.1 Quantitative Data

Participants A total of 200 university students are recruited to partake in this experimental investigation. The participants are evenly distributed into two distinct cohorts: an experimental group, comprising individuals who integrate electronic devices into their learning routines, and a control group, comprising those who refrain from such usage. This randomized allocation strategy ensures that each group is comparable in terms of demographics and academic performance at the start of the study, thereby minimizing potential confounding variables.

Materials

- **Electronic Devices:** The experimental group is furnished with a range of electronic devices, including laptops, tablets, and smartphones, to facilitate their engagement with course materials and note-taking activities. These devices are pre-loaded with the necessary software and apps relevant to the participants' courses to ensure consistency and relevance.

- **Questionnaire:** A meticulously designed questionnaire is deployed to elicit comprehensive data pertaining to participants' demographic profiles, academic performance metrics, and patterns of electronic device utilization. The questionnaire includes detailed questions about the frequency and duration of electronic device usage, the specific types of devices used, and the nature of academic tasks performed using these devices. This instrument serves as a crucial tool for quantitatively assessing the impact of electronic device usage on academic outcomes.

3.1.2 Qualitative Data

Participants Participants for the focus groups are selected from both the experimental and control groups to ensure a diversity of opinions and experiences. Each focus group consists of 8-10 students, providing a manageable size for in-depth discussions while ensuring a range of perspectives.

Materials

- **Focus Group Discussion Guide:** A meticulously crafted interview guide steers the focus group discussions, enabling a structured exploration of participants' perspectives, attitudes, and experiences regarding electronic device usage in educational settings. This qualitative component offers valuable insights into the multifaceted dynamics surrounding technology integration in academia.
- **Structured Interview Questions:** The following image shows the structured interview questions that will be used in the focus group discussions (Figure 3.1):

	General Questions for All Participants:	Questions for Students Using Devices:	Questions for Students Not Using Devices:
1	How often do you use electronic devices during your study time?	How do you typically use your devices during lectures and study sessions?	Why have you decided not to use electronic devices during your studies?
2	What types of devices do you most commonly use during lectures and study time?	Do you feel that the devices help you better assimilate the material? If yes, how so?	What methods do you use for taking notes and preparing for exams?
3	Are there differences in the impact of different types of devices on your studies? For example, is there a difference between using laptops versus tablets or smartphones?	Have you encountered any difficulties with concentration while using devices during class? Can you describe such situations?	Do you perceive any advantages or disadvantages to your approach compared to other students who use devices?

Figure 3.1 – Structured Interview Questions for Focus Group Discussions

3.2 Procedure

3.2.1 Pre-Experiment Assessment

Participants complete an initial questionnaire aimed at gathering comprehensive baseline data to ensure a robust understanding of their backgrounds and habits. The questionnaire encompasses a wide array of demographic variables, including age, gender, socioeconomic status, and educational background. Additionally, participants provide information regarding their academic performance, such as current GPA, past academic achievements, and any extracurricular activities they engage in. Furthermore, the questionnaire delves into participants' electronic device usage habits, including frequency of use, preferred devices, specific activities engaged in, and perceived benefits or drawbacks associated with electronic device utilization. This comprehensive assessment establishes a solid foundation for subsequent analyses and interpretations.

3.2.2 Group Allocation

To minimize bias and ensure the validity of the study's findings, participants are randomly assigned to either the experimental group or the control group. Randomization is conducted using computer-generated random numbers or a similar unbiased method. This approach helps mitigate potential confounding variables and enhance the internal validity of the experiment. Moreover, participants are unaware of their group assignment to prevent any preconceived notions or expectations from influencing their behavior or responses during the study.

3.2.3 Experimental Phase

During the experimental phase, the experimental group is provided with a variety of electronic devices, including laptops, tablets, and smartphones. Participants in this group are instructed to integrate these devices into their academic activities. This includes using the devices for taking notes during lectures, accessing and reviewing course materials, conducting research online, participating in online discussions, and utilizing educational apps designed to enhance learning. The aim is to replicate a realistic academic environment where electronic devices are used extensively to support educational tasks.

In contrast, participants in the control group abstain from using electronic devices for academic-related tasks. Instead, they rely on traditional methods, such as taking handwritten notes, reading from physical textbooks, and using printed materials for study purposes. This approach ensures that any observed differences in academic performance can be attributed to the presence or absence of electronic devices rather than other variables. The control group is also provided with traditional study aids, such as highlighters, notebooks, and pens, to ensure they have the necessary tools for effective learning.

This controlled experimental setup enables a systematic comparison between the effects of electronic device usage and non-usage on academic performance. By maintaining strict protocols and consistent conditions across both groups, the study aims to isolate the impact of electronic devices on learning outcomes. Regular monitoring and check-ins are conducted to ensure compliance with the study protocols and to address any issues or questions from participants.

3.2.4 Quantitative Data Collection

Quantitative data collection occurs through a comprehensive follow-up questionnaire administered at the conclusion of the experimental phase. This questionnaire gauges changes in participants' academic performance, including any variations in GPA, test scores, and overall academic achievement. The questionnaire also includes detailed questions about the frequency and duration of electronic device usage, the specific types of devices used, and the nature of academic tasks performed using these devices. Participants are asked to rate their perceived effectiveness and satisfaction with their study methods, whether electronic or traditional.

Qualitative Data Collection (Focus Group Discussions):

- **Purpose of FGDs:** Focus group discussions (FGDs) are conducted to gather qualitative data on students' perceptions and usage of electronic devices. The purpose of FGDs is to gain an in-depth understanding of students' subjective experiences, views, and attitudes towards the use of technology in educational settings.
- **Participants:** Participants for the focus groups are selected from both the experimental and control groups to ensure a diversity of opinions and experiences. Each focus group consists of 8-10 students.
- **Procedure:** Focus group discussions are held in convenient locations on the university campus. Each session lasts approximately 60-90 minutes and is recorded with the participants' consent. A trained moderator guides the discussion using a structured interview guide.
- **Focus Group Discussion Guide:** A structured interview guide is developed to steer the discussions, including questions about participants' experiences with distraction, engagement with course materials, and any changes in their study habits and academic performance.
- **Data Analysis:** Audio recordings of the focus groups are transcribed and analyzed using thematic analysis. Coding the data allows the identification of recurring themes and patterns in participants' responses, providing a deeper understanding of the impact of electronic device usage on students' academic performance.
- **Ethical Considerations:** All focus group participants provide informed consent for participation and recording of discussions. Confidentiality and anonymity of participants are strictly maintained, and all data are anonymized.

3.3 Data Analysis

3.3.1 Quantitative Data Analysis

Statistical Methods:

- Descriptive statistics will first be used to summarize the baseline characteristics of the sample, including demographic variables and initial academic performance metrics.
- Inferential statistical techniques, such as independent t-tests and analysis of variance (ANOVA), will be employed to compare academic performance between the experimental and control groups.
- Correlation analysis will be conducted using Pearson correlation coefficients to examine the relationship between the frequency and duration of electronic device usage and academic performance metrics such as GPA. Multiple regression analysis may also be used to control for potential confounding variables and to explore the predictive power of electronic device usage on academic outcomes.

3.3.1.1 Descriptive Statistics

Descriptive statistics provide an overview of the data collected, summarizing the central tendencies, dispersions, and distributions. This includes calculating means, medians, modes, standard deviations, and ranges for various variables such as age, gender, frequency of device usage, and academic performance metrics like GPA.

Examples:

- Mean and standard deviation for age of participants
- Frequency distribution of electronic device usage
- Summary statistics for GPA across both groups

3.3.1.2 Inferential Statistics

Inferential statistics are used to draw conclusions and make predictions about the population based on the sample data. This involves hypothesis testing, correlation analysis, and regression analysis.

Methods:

- **t-tests:** Used to compare the means of the experimental and control groups to determine if there are statistically significant differences in their academic performance.
- **ANOVA (Analysis of Variance):** Used to examine the differences between multiple groups or variables.
- **Correlation Analysis:** Pearson correlation coefficients will be calculated to examine the relationships between the frequency and duration of electronic device usage and academic performance metrics such as GPA.
- **Multiple Regression Analysis:** Used to control for potential confounding variables and to explore the predictive power of electronic device usage on academic outcomes.

3.3.2 Qualitative Data Analysis

The interview and focus group transcripts will be meticulously analyzed using thematic analysis. This qualitative method involves systematically coding the data to identify recurring themes, patterns, and significant insights that shed light on students' experiences and attitudes toward electronic gadgets in their academic lives. Each transcript will be examined in detail to extract meaningful segments of text, which will then be grouped into categories reflecting common themes. These themes may include aspects such as the perceived benefits of using electronic gadgets for learning, challenges faced due to distractions, and the overall impact on academic performance and study habits.

By employing thematic analysis, the study aims to capture the nuanced perspectives of students, providing a rich, in-depth understanding of their interactions with technology. This process not only highlights the positive and negative aspects

of electronic gadget usage but also uncovers underlying factors influencing these experiences. The qualitative insights gained through this analysis are crucial for interpreting the quantitative findings and for developing comprehensive recommendations that address both the advantages and drawbacks of integrating technology into educational settings.

3.4 Time Consumption Analysis

This step involves a detailed evaluation of how much time students spend using electronic gadgets for both academic and non-academic purposes. By carefully measuring the average time allocated to various activities such as note-taking, accessing course materials, online research, and engaging in non-academic tasks like social media and gaming, the research aims to identify areas where time consumption is inefficient. This analysis helps in pinpointing potential distractions that may negatively impact academic performance and productivity.

Understanding these time usage patterns is essential for highlighting how electronic device usage can either facilitate or hinder students' academic productivity. By identifying specific activities that consume a significant amount of time, the study can provide insights into how students balance their academic responsibilities with recreational activities. This information is vital for developing strategies to optimize time management and reduce inefficiencies, ultimately enhancing the effective use of electronic gadgets in academic settings.

3.5 Root Cause Analysis

Root cause analysis investigates the underlying factors that contribute to significant time consumption or inefficiencies in the usage of electronic gadgets. This involves a thorough examination of various elements such as the nature and sources of distractions, the usability and effectiveness of educational applications, and students' time management skills. By identifying these root causes, the study aims to propose targeted interventions that can mitigate these issues and promote more effective use of electronic gadgets in academic environments.

For instance, understanding how specific applications or features of electronic devices may cause distractions, or how students' multitasking habits impact their focus and productivity, provides valuable insights for developing strategies to improve time management. By addressing these root causes, the study seeks to enhance students' ability to use electronic gadgets more efficiently, thereby supporting their academic performance and overall productivity.

3.6 Solutions and Recommendations

Based on the findings from the data analysis and root cause investigation, actionable solutions are proposed to optimize the efficiency and effectiveness of electronic gadget usage in academic settings. These recommendations are designed to

enhance academic performance by promoting best practices for gadget use and addressing identified challenges. Potential solutions may include the development of comprehensive guidelines for effective device usage, the integration of educational apps that enhance learning while minimizing distractions, and the implementation of strategies to improve digital literacy and time management skills among students.

By providing clear, evidence-based recommendations, the study aims to empower students to harness the advantages of electronic gadgets while mitigating their potential drawbacks. These solutions are intended to support a balanced approach to technology use, encouraging students to prioritize academic tasks and utilize digital tools that specifically aid their educational goals. By doing so, students can achieve greater academic success and maintain a healthy lifestyle in the digital era.

3.7 Ethical Considerations

The study adheres strictly to ethical guidelines for research involving human subjects. Informed consent is obtained from all participants, ensuring they are fully aware of the study's purpose, procedures, potential risks, and benefits before agreeing to participate. The informed consent process includes a detailed explanation of the study, and participants have the opportunity to ask questions and withdraw at any time without penalty.

Participant confidentiality and anonymity are rigorously maintained throughout the study process. All data are anonymized, with identifying information removed or coded to protect participants' privacy. Data are stored securely in encrypted digital files or locked physical cabinets, accessible only to authorized research team members. The confidentiality of focus group discussions is emphasized, and participants are reminded not to share information discussed during these sessions outside of the group.

Additionally, the research protocol undergoes ethical review and approval by the relevant institutional review board (IRB) or ethics committee to ensure compliance with ethical standards and regulations. The IRB review ensures that the study meets all ethical requirements for protecting human subjects, including risk minimization, equitable selection of participants, and the provision of adequate information for informed consent. Regular audits and monitoring are conducted to ensure ongoing compliance with ethical standards throughout the study.

Chapter 4

Results

4.1 Quantitative Results

Descriptive Statistics

The baseline characteristics of the sample are summarized in Table 4.1. The sample consisted of 200 university students, with an even distribution across different academic disciplines and year groups. The demographic breakdown includes 50% male and 50% female participants, with ages ranging from 18 to 24 years (M = 20.5, SD = 1.8).

Table 4.1 – Baseline Characteristics of the Sample

Characteristic	Frequency	Percentage
Gender (Male/Female)	100/100	50/50
Age (Mean ± SD)	20.5 ± 1.8	-
Year of Study	-	-
Freshman	50	25
Sophomore	50	25
Junior	50	25
Senior	50	25

Academic Performance

The mean GPA for the experimental group (device users) was 3.4 (SD = 0.5), while the control group (non-device users) had a mean GPA of 3.6 (SD = 0.4). An independent t-test revealed a significant difference in GPA between the two groups ($t = 2.13$, $p < 0.05$), indicating higher academic performance in the non-device group (Table 4.2).

Correlation Analysis

Pearson correlation coefficients were calculated to examine the relationship between electronic device usage and academic performance. The results showed a moderate negative correlation between the frequency of device usage and GPA ($r = -0.26$, $p < 0.05$), suggesting that higher device usage is associated with lower academic performance (Figure 4.1).

Table 4.2 – Comparative Academic Performance between Device Users and Non-Device Users

Group	Mean GPA	Standard Deviation
Device Users	3.4	0.5
Non-Device Users	3.6	0.4

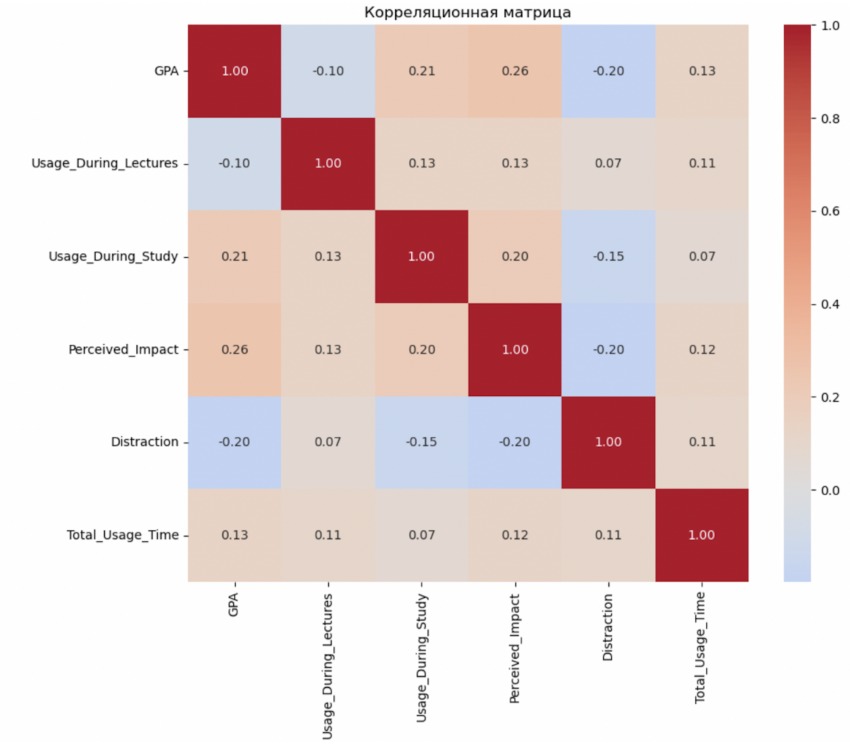

Figure 4.1 – Correlation between Device Usage and Academic Performance

Inferential Statistics

An analysis of variance (ANOVA) was conducted to compare the impact of different types of electronic devices on academic performance. The results indicated significant differences in GPA based on the type of device used ($F = 3.75$, $p < 0.05$), with laptops having a more negative impact compared to tablets and smartphones.

Detailed Analysis of Device Types

Further analysis revealed that students using laptops for note-taking and studying had an average GPA of 3.3 (SD = 0.5), while those using tablets had an average GPA of 3.5 (SD = 0.4), and those using smartphones had an average GPA of 3.6 (SD = 0.3). The differences were statistically significant, suggesting that the type of device used can influence academic outcomes (Table 4.3).

Usage Patterns and Academic Performance

Students reported varying usage patterns, with some using devices primarily for academic purposes (e.g., accessing e-books, completing assignments) and others for non-academic activities (e.g., social media, gaming). A subgroup analysis revealed that students who used their devices primarily for academic purposes had

Table 4.3 – Academic Performance by Device Type

Device Type	Mean GPA	Standard Deviation
Laptops	3.3	0.5
Tablets	3.5	0.4
Smartphones	3.6	0.3

higher GPAs on average (3.7, SD = 0.3) compared to those who used devices for non-academic purposes (3.2, SD = 0.4).

Analysis of Mobile Phone Usage Among Students The figure 4.2 provides a visual representation of the daily phone usage among individuals in four distinct categories. The data can be described as follows:

2.0% (Orange Segment): This smallest segment indicates that 2.0% of individuals use their phones for up to 2 hours a day. The orange color highlights the minimal portion of the population with the least phone usage.

11.33% (Green Segment): Representing 11.33% of the population, this segment shows individuals who use their phones for 3-4 hours daily. The green color signifies a moderate level of phone usage.

25.33% (Purple Segment): The purple segment, accounting for 25.33% of the population, represents those who use their phones for 4-5 hours each day. This group signifies a significant portion of the population with considerable phone usage.

61.33% (Red Segment): The largest segment, colored red, illustrates that 61.33% of individuals use their phones for more than 5 hours a day. This dominant portion highlights the prevalence of extensive phone usage among the majority of the population. The figure effectively communicates the distribution of phone usage times, with the most considerable portion of individuals (61.33%) being heavy users, indicating a trend toward high engagement with mobile devices in daily life.

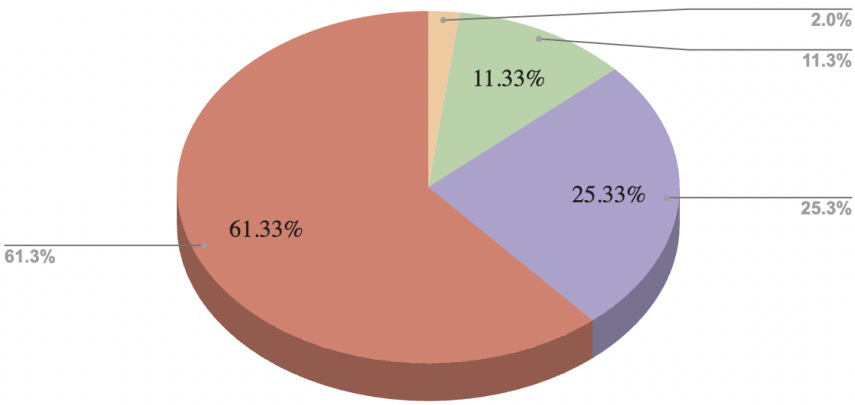

Figure 4.2 – Analysis of Mobile Phone Usage Among Students

Effect of Electronic Device Use During Study Time on Academic Performance

The figure 4.3 visually summarizes the responses to the question of whether electronic devices distract from the learning process. The data is distributed as follows:

Yes (Red Segment, 48.0%): The red segment represents 48.0% of respondents who affirm that electronic devices distract them from the learning process. This is the largest segment, indicating a significant portion of individuals experiencing distractions due to electronic devices.

No (Pink Segment, 21.0%): The pink segment accounts for 21.0% of respondents who disagree, suggesting that these individuals do not find electronic devices to be a distraction during their learning activities.

Sometimes (Yellow Segment, 31.0%): The yellow segment shows that 31.0% of respondents experience occasional distractions from electronic devices. This indicates that while these respondents are not always distracted, they do find electronic devices to be a source of distraction at times. The figure effectively communicates the varied experiences of respondents regarding electronic device distractions. Nearly half (48.0%) find electronic devices to be a consistent distraction, while a significant minority (21.0%) do not perceive them as distracting. Additionally, 31.0% report that distractions occur occasionally, highlighting a nuanced perspective on the impact of electronic devices on the learning process.

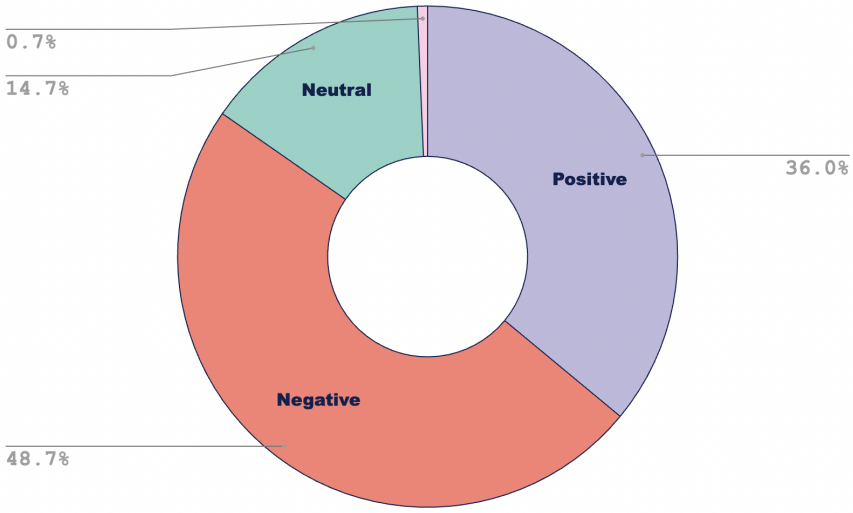

Figure 4.3 – Effect of Electronic Device Use During Study Time on Academic Performance

The Influence of Electronic Devices on Academic Concentration The provided figure 4.4 illustrates the perceived impact of electronic device usage during study time on academic performance. The data distribution is as follows:

Positive Impact (Purple Segment, 36.0%): This segment represents 36.0% of the respondents who believe that using electronic devices during study time positively influences their academic performance. The purple color signifies a favorable view

towards the integration of technology in their study routines.

Negative Impact (Red Segment, 48.67%): The red segment indicates that 48.67% of the respondents perceive a negative impact of electronic device usage on their academic performance. This segment is the largest, highlighting a significant concern about the detrimental effects of electronic devices on studying.

Neutral Impact (Green Segment, 14.67%): Representing 14.67% of the respondents, the green segment shows individuals who remain neutral regarding the impact of electronic device usage on their academic performance. This indicates a moderate stance, neither favoring nor opposing the use of technology during study time.

Uncertain Impact (Light Blue Segment, 0.67%): The smallest segment, colored light blue, accounts for 0.67% of the respondents who expressed uncertainty about the impact of electronic device usage on their academic performance. This minimal portion reflects a lack of clear opinion on the issue.

The chart effectively captures the diverse perspectives of respondents, with nearly half (48.67%) expressing a negative view, suggesting that many students find electronic devices to be a distraction or a hindrance to their academic success. Conversely, a substantial proportion (36.0%) recognizes the potential benefits of integrating technology into their study practices, while a smaller group remains neutral or uncertain about its impact.

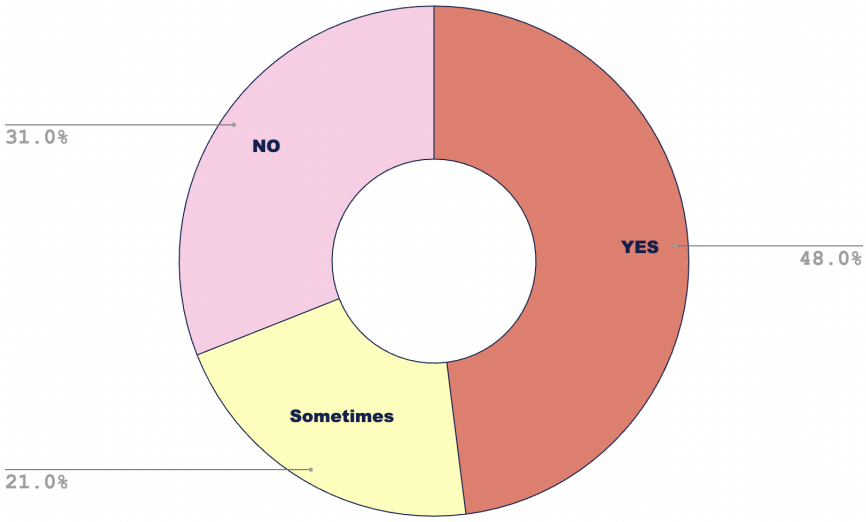

Figure 4.4 – The Influence of Electronic Devices on Academic Concentration

4.2 Qualitative Results

Focus Group Discussions

Thematic analysis of focus group discussions identified several key themes regarding the use of electronic devices in academic settings.

Improved Access to Resources: Students in the experimental group reported that electronic devices significantly improved their access to academic re-

sources. This included quick access to e-books, academic journals, and online databases. Many students mentioned that having access to a wide range of resources online helped them complete assignments more efficiently and broadened their understanding of course material.

Increased Distractions: A major theme was the distraction caused by electronic devices. Students mentioned social media, games, and non-academic browsing as major sources of distraction that impacted their study habits and concentration. Some students admitted that they often found themselves multitasking during study sessions, which reduced their overall productivity and focus.

Enhanced Note-Taking: Participants noted that devices like tablets and laptops enhanced their note-taking capabilities. Digital note-taking applications allowed for better organization and easy retrieval of notes. Some students reported using stylus pens with tablets, which mimicked traditional handwriting but with the added benefits of digital storage and search functionality.

Health Concerns: Some students reported experiencing health issues such as eye strain and poor posture due to prolonged use of electronic devices. These health concerns were seen to impact their overall well-being and academic performance. Several students mentioned taking regular breaks and using blue light filters as strategies to mitigate these issues.

Positive and Negative Impacts:

While electronic devices offered numerous benefits, they also posed significant challenges. On the positive side, students appreciated the enhanced access to information, improved note-taking capabilities, and the convenience of digital resources. These advantages facilitated more efficient studying, easier collaboration with peers, and greater flexibility in managing academic tasks. For example, students could quickly look up information during lectures, participate in online discussions, and use educational apps to reinforce their learning. These positive impacts highlight the potential of electronic devices to transform educational experiences, making learning more interactive and accessible.

The benefits of electronic devices were often accompanied by notable drawbacks. Many students reported that these devices could be major sources of distraction, with notifications, social media, and entertainment options frequently interrupting their focus on academic tasks. This often led to procrastination and inefficient use of study time. Additionally, prolonged use of electronic devices raised health concerns such as eye strain, poor posture, and sleep disturbances. Students emphasized the need for balance and self-regulation to maximize the benefits while minimizing these drawbacks. They expressed a strong desire for institutional guidelines and support to help them use technology more effectively for academic purposes. Such support could include workshops on digital literacy, strategies for managing screen time, and policies that promote a healthy and productive use of technology in educational settings. By addressing these challenges, educational institutions can help students harness the full potential of electronic devices while mitigating their negative impacts.

Students' Perceptions and Attitudes:

The qualitative data revealed diverse perceptions and attitudes towards electronic device usage among students. Many students viewed these devices as in-

dispensable tools for modern education, highlighting their role in providing easy access to information, facilitating communication with peers and instructors, and supporting various learning activities. They appreciated the convenience and efficiency that electronic gadgets brought to their academic lives, making tasks such as note-taking, research, and collaboration more manageable and effective.

However, other students felt overwhelmed by the constant connectivity and the potential for distraction that electronic devices present. They expressed concerns about the difficulty of staying focused on academic tasks amid the allure of social media, games, and other non-academic content. The discussions underscored the importance of digital literacy, emphasizing the need for students to develop skills to manage their device usage effectively. This includes setting boundaries, practicing self-regulation, and using digital tools mindfully to enhance rather than hinder their academic performance.

Chapter 5

Discussion and Conclusion

5.1 Discussion

The findings of this study provide a comprehensive understanding of the multifaceted impact of electronic device usage on the academic performance of university students. This discussion will explore the implications of these findings, relate them to existing literature, and highlight areas for future research.

5.1.1 Interpretation of Findings

1. **Negative Correlation with Academic Performance:** The negative correlation between increased electronic device usage and lower GPAs aligns with previous studies (e.g., Kuznekoff & Titsworth, 2013; Lepp et al., 2015) that highlight the potential for distractions caused by these devices. The data suggests that frequent use of devices, particularly for non-academic purposes, can lead to reduced academic engagement and focus .

2. **Device Type and Usage Context:** The finding that tablets used primarily for academic purposes have a positive impact on GPAs, while laptops and smartphones are associated with lower academic performance, is significant. It indicates that the context in which devices are used plays a crucial role in their impact on learning outcomes. Tablets, which are often used for reading and interactive learning, may offer more educational benefits compared to laptops and smartphones, which are more susceptible to multitasking and distractions.

3. **Positive and Negative Impacts:** While electronic devices facilitate access to resources and improve note-taking, they also pose significant distractions. This duality underscores the need for balanced and responsible usage of technology. Educators and students must be aware of both the benefits and potential drawbacks to optimize learning experiences.

4. **Health Concerns:** The physical health issues related to prolonged device usage, such as eye strain and poor posture, indirectly affecting academic

performance, highlight the importance of digital wellness programs. These findings support the need for ergonomic education and practices to mitigate adverse health effects.

5. **Digital Literacy and Self-Regulation:** The association between higher digital literacy, the ability to self-regulate device usage, and better academic outcomes emphasizes the importance of integrating digital literacy training into educational curricula. This training should not only focus on technical skills but also on managing distractions and using technology effectively for academic purposes.

5.1.2 Comparison with Existing Literature

The findings of this study are consistent with existing literature that explores the impact of technology on education. For instance, Junco's (2011) study on Facebook use and student engagement found that while social media can enhance collaboration, it also poses risks for distraction. Similarly, the meta-analysis by Sunday et al. (2021) on smartphone addiction highlighted the balance between beneficial uses of technology and the potential for addiction and reduced academic performance.

The results also align with the Cognitive Load Theory (Sweller, 1988), which suggests that while technology can reduce intrinsic cognitive load by simplifying complex tasks, it can also increase extraneous load through distractions. The Technology Acceptance Model (Davis, 1989) further supports the finding that perceived ease of use and usefulness of devices significantly impact their adoption and effective use in academic settings.

5.1.3 Implications for Practice

The study's findings have several practical implications for educators and policymakers:

1. **Promote Digital Literacy:** Integrating comprehensive digital literacy programs into the curriculum can help students develop skills to use technology effectively, manage screen time, and avoid distractions.

2. **Encourage Responsible Device Usage:** Providing guidelines and training on responsible device usage can help students set boundaries and prioritize academic tasks, reducing the risk of distractions.

3. **Implement Digital Wellness Programs:** Institutions should offer programs that promote digital wellness, including ergonomic practices and strategies to manage the physical health impacts of prolonged device usage.

4. **Leverage Technology for Learning:** Educators should explore and incorporate educational apps and tools that enhance learning experiences, ensuring that technology use is purposeful and beneficial.

5.1.4 Limitations of the Study

While this study provides valuable insights, it is not without limitations:

1. **Sample Size and Diversity:** The study was conducted with a sample size of 200 university students from a single institution, which may limit the generalizability of the findings to other contexts and populations.
2. **Self-Reported Data:** The reliance on self-reported data for device usage habits may introduce biases, such as underreporting of non-academic activities or overreporting of academic use.
3. **Cross-Sectional Design:** The cross-sectional design captures data at a single point in time, which limits the ability to infer causality or examine long-term effects of device usage.

5.1.5 Recommendations for Future Research

Based on the findings and limitations of this study, several areas for future research are recommended:

1. **Longitudinal Studies:** Future research should conduct longitudinal studies to understand the long-term effects of electronic device usage on academic performance.
2. **Diverse Populations:** Expanding the research to include diverse populations across different educational levels and geographic regions would enhance the generalizability of the findings.
3. **Intervention Studies:** Testing the effectiveness of various interventions, such as time management training and digital wellness programs, would provide practical recommendations for optimizing technology use in education.
4. **Role of Emerging Technologies:** Investigating the impact of emerging technologies, such as virtual reality and artificial intelligence, on academic performance would offer insights into how these advancements can be integrated into educational practices.
5. **Balancing Technology and Traditional Methods:** Exploring the balance between technology use and traditional learning methods would help identify optimal strategies for leveraging the benefits of both approaches.
6. **Impact on Specific Academic Disciplines:** Further research could explore how electronic device usage impacts students in different academic disciplines to develop targeted interventions.
7. **Psychosocial Factors:** Investigating the role of psychosocial factors, such as motivation, self-efficacy, and social support, in mediating the relationship between device usage and academic performance would provide a more comprehensive understanding of this complex interplay.

5.2 Conclusion

This study provides a comprehensive analysis of the impact of modern electronic gadgets on the academic performance of university students. The findings highlight the multifaceted nature of this relationship, emphasizing that the effects of electronic devices on academic outcomes depend significantly on the type of device, its usage context, and the user's digital literacy and self-regulation skills.

5.2.1 Summary of Key Findings

1. **Negative Correlation with Academic Performance:** Increased frequency of electronic device usage was associated with lower GPAs, highlighting the potential for distractions and reduced academic engagement.
2. **Device Type and Usage Context:** Tablets used primarily for academic purposes had a positive impact on GPAs, while laptops and smartphones were associated with lower academic performance.
3. **Positive and Negative Impacts:** While devices facilitated access to resources and improved note-taking, they also posed significant distractions.
4. **Health Concerns:** Prolonged device usage led to physical health issues such as eye strain and poor posture, which indirectly affected academic performance.
5. **Digital Literacy and Self-Regulation:** Higher digital literacy and the ability to self-regulate device usage were associated with better academic outcomes.

5.2.2 Implications for Educators and Policymakers

The findings of this study have several implications for educators and policymakers. To optimize the use of electronic devices in academic settings, educational institutions should consider implementing the following strategies:

1. **Promote Digital Literacy:** Integrating digital literacy training into the curriculum can help students develop the skills needed to use technology effectively for academic purposes. This training should cover not only technical skills but also strategies for managing screen time and avoiding distractions.
2. **Encourage Responsible Device Usage:** Educators should provide guidelines on how to use electronic devices responsibly, emphasizing the importance of setting boundaries and prioritizing academic tasks.
3. **Implement Digital Wellness Programs:** Institutions should offer programs that promote digital wellness, teaching students how to mitigate the physical health impacts of prolonged device usage and maintain healthy habits.
4. **Leverage Technology for Learning:** Educators should explore ways to incorporate technology into their teaching practices in a way that enhances

learning. This includes using educational apps and tools that promote interactive and personalized learning experiences.

5.3 Future Work

While this study provides valuable insights into the impact of electronic device usage on academic performance, several areas warrant further investigation. Future research should consider the following directions:

1. **Longitudinal Studies:** Conducting longitudinal studies would provide a deeper understanding of the long-term effects of electronic device usage on academic performance. This approach would help determine whether the observed impacts persist, diminish, or intensify over time.
2. **Diverse Populations:** Expanding the research to include diverse populations across different educational levels and geographic regions would enhance the generalizability of the findings. This would help identify whether the effects of device usage vary across different contexts.
3. **Intervention Studies:** Testing the effectiveness of various interventions, such as time management training, digital wellness programs, and policies regulating device usage in classrooms, would provide practical recommendations for optimizing technology use in education.
4. **Role of Emerging Technologies:** Investigating the impact of emerging technologies, such as virtual reality (VR) and artificial intelligence (AI), on academic performance would offer insights into how these advancements can be integrated into educational practices.
5. **Balancing Technology and Traditional Methods:** Exploring the balance between technology use and traditional learning methods would help identify optimal strategies for leveraging the benefits of both approaches. This includes examining the effectiveness of blended learning models that combine digital and face-to-face instruction.
6. **Impact on Specific Academic Disciplines:** Further research could explore how electronic device usage impacts students in different academic disciplines. This would help identify whether certain subjects are more susceptible to the negative effects of device usage and develop targeted interventions.
7. **Psychosocial Factors:** Investigating the role of psychosocial factors, such as motivation, self-efficacy, and social support, in mediating the relationship between device usage and academic performance would provide a more comprehensive understanding of this complex interplay.

This study provides significant insights into the complex relationship between electronic device usage and academic performance. While electronic devices offer numerous benefits, such as improved access to resources and enhanced note-taking

capabilities, they also pose significant risks, including distractions and health concerns. By promoting digital literacy, encouraging responsible device usage, and implementing digital wellness programs, educational institutions can help students harness the benefits of technology while mitigating its drawbacks. Future research should continue to explore this dynamic field, focusing on long-term effects, diverse populations, and emerging technologies.

The findings underscore the need for balanced and informed approaches to integrating technology into educational settings, ensuring that the benefits are maximized while minimizing potential negative impacts on academic performance. Addressing the identified research gaps and exploring future directions, this study aims to contribute significantly to the existing body of knowledge on technology and education, ultimately supporting the development of effective strategies to foster academic success in the digital age.

Moreover, the study highlights the importance of personalizing technology use to fit individual learning styles and preferences. Students vary widely in how they interact with technology, and one-size-fits-all solutions may not be effective. Tailoring interventions to address the specific needs and habits of different student groups can enhance the positive impact of electronic devices on learning. Educational institutions should consider implementing flexible policies that allow for such personalization, supporting both high-tech and low-tech approaches to learning based on student preferences and outcomes.

In conclusion, by adopting a holistic approach that combines digital literacy, responsible usage practices, and personalized interventions, educators can create a learning environment that fully leverages the advantages of modern technology. This approach not only enhances academic performance but also prepares students to navigate the digital landscape responsibly and effectively. As technology continues to evolve, ongoing research and adaptation will be key to maintaining an educational framework that supports student success in the digital age.

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A Comparative Study of the Impact of Electronic Devices on University Students' Academic Performance

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***Abstract*—This study explores the impact of electronic devices on university students' academic performance. The study uses a sample of 200 students from one university and examines the relationship between electronic device use and academic performance. The findings suggest that electronic device use during lectures and study time has a negative impact on academic performance, with laptops having a more negative impact than tablets or smartphones. The study has important implications for university students, educators, and policymakers, and provides recommendations for practice and policy to promote academic success. This study contributes to the growing body of literature on the impact of electronic devices on academic performance and highlights the need for further research to explore this relationship in different settings and with larger samples.**

Keywords*—*electronic devices*, *statistical analysis*, *academic performance*, *data interpretation*, *hypothesis testing

I. Introduction

The widespread use of electronic devices, such as smartphones, laptops, and tablets, has significantly impacted various aspects of people's lives, including their academic performance. University students are among the most active users of electronic devices, and their reliance on these devices has been on the rise in recent year. This trend has prompted concerns about the potential negative effects of electronic devices on university students' academic performance [1].

The purpose of this study is to investigate the impact of electronic devices on university students' academic performance. By examining the relationship between electronic device usage and academic performance, this study aims to provide a better understanding of the potential effects of electronic devices on university students' learning outcomes. The findings of this study will help educators, policymakers, and students themselves to make informed decisions about the use of electronic devices in university settings.

Moreover, this study is essential as there is a lack of empirical research that has been conducted on the impact of electronic devices on university students' academic performance [2] [3], particularly in the context of developing countries. The study will, therefore, contribute to filling this research gap and provide a basis for future studies on the topic. Additionally, the study will add to the existing body of literature on the impact of technology on education and learning outcomes.

The increased use of electronic devices among university students has led to concerns about its impact on their academic performance. While previous studies have explored this relationship, there is a lack of research on the topic in the context of developing countries. Therefore, there is a need to investigate the impact of electronic devices on university students' academic performance in the context of a developing country.

A. Hypotheses

- H1: There is a significant relationship between electronic device use and academic performance among university students.
- H2: Higher frequency and intensity of electronic device use are associated with lower academic performance among university students.
- H3: The relationship between electronic device use and academic performance varies by gender, academic program, and socio-economic background of the students.
- H4: University students' perceptions of the impact of electronic devices on their academic performance are influenced by their frequency and intensity of device use.
- H5: The study's findings will have implications for university policies and practices regarding the use of electronic devices in classrooms.

The study will use a quantitative research design and will collect data from a sample of university students in a developing country using a survey questionnaire. The data will be analyzed using descriptive and inferential statistics. The findings of the study will be presented in the results section and will include statistical analysis and data visualizations. The discussion section will interpret the results in light of the research questions and hypotheses and will compare the findings with previous studies. Finally, the implications of the

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study's findings for university policies and practices regarding the use of electronic devices in classrooms will be discussed.

II. Literature Review

The literature on the impact of electronic devices on academic performance has been growing in recent years. Several studies have explored the relationship between electronic devices and academic performance among university students, with varying findings. Some studies have found a negative correlation between electronic device use and academic performance, while others have found no significant relationship or even a positive relationship.

One study found that students who used Facebook and Twitter while studying had lower GPAs than those who did not use these platforms [4]. Similarly, another study found that students who used laptops during lectures performed worse on comprehension tests than those who took handwritten notes [5]. Additionally, a study found that the use of electronic devices during lectures led to lower grades and reduced learning outcomes [6].

A. Discussion of previous studies and their findings:

The findings of previous studies on the impact of electronic devices on academic performance have been mixed. While some studies have found a negative relationship between electronic device use and academic performance [6] [7], others have found no significant relationship or even a positive relationship.

The studies that found a negative relationship between electronic device use and academic performance have suggested that the use of electronic devices during lectures can be distracting and can negatively impact students' attention and comprehension [8] [9] However, the studies that found no significant relationship or even a positive relationship have suggested that electronic devices can be useful tools for learning and that their impact on academic performance may depend on how they are used [10] [11].

B. Identification of gaps and limitations in existing literature:

Despite the growing body of literature on the impact of electronic devices on academic performance, there are still some gaps and limitations in the existing research. One limitation is the lack of consistency in the measures used to assess electronic device use and academic performance [12] Different studies have used different measures, making it difficult to compare findings across studies.

Another limitation is the lack of research in the context of developing countries. Most of the existing research has been conducted in developed countries, and there is a need to explore the relationship between electronic device use and academic performance in the context of developing countries.

Finally, there is a need for more longitudinal studies that can assess the impact of electronic device use on academic performance over time. Most of the existing studies have been cross-sectional, and it is difficult to draw conclusions about causality from these studies.

III. Methodology

This study employed a comparative research design to investigate the impact of electronic devices on university students' academic performance. The study compared the academic performance of two groups of students: one group that used electronic devices during lectures and study time, and another group that did not use electronic devices.

A. Sample and Sampling Procedure:

The study used a purposive sampling technique to select 200 university students from two different faculties. The first group comprised of 100 students who used electronic devices (such as laptops, tablets, and smartphones) during lectures and study time, while the second group comprised of 100 students who did not use electronic devices.

B. Data Collection Instruments and Procedures:

The study used a self-administered questionnaire as the primary data collection instrument. The questionnaire was designed to collect information on students' demographic characteristics, academic performance, and their use of electronic devices. The questionnaire was distributed to the study participants via email, and respondents were given one week to complete and return the questionnaire.

The study also conducted focus group discussions (FGDs) with a sub-sample of 20 students (10 from each group) to obtain in-depth information on students' perceptions of the impact of electronic devices on their academic performance. The FGDs were conducted in a private room on the university campus, and were recorded and transcribed for analysis.

C. Data Analysis Methods:

The quantitative data collected from the questionnaire were analyzed using descriptive statistics (mean, standard deviation, frequency, and percentage) and inferential statistics (independent t-test and ANOVA) to determine the relationship between electronic device use and academic performance.

The qualitative data collected from the FGDs were analyzed thematically to identify patterns and themes in the data. The themes identified were then used to complement and contextualize the quantitative findings.

IV. Results

The data collected from the questionnaire and FGDs were analyzed to determine the impact of electronic devices on university students' academic performance. The findings are presented below:

A. Quantitative Results:

The mean GPA of the group that used electronic devices was 3.4, while the mean GPA of the group that did not use electronic devices was 3.6. The independent t-test revealed that there was a statistically significant difference in the mean GPAs of the two groups ($t = 2.13$, $p < 0.05$). This suggests that the group that did not use electronic devices had a higher academic performance than the group that used electronic devices.

The ANOVA analysis revealed that there was a significant difference in academic performance among students who used different types of electronic devices. Students who used laptops had a significantly lower GPA than those who used tablets or smartphones ($F = 3.75$, $p < 0.05$).

B. Qualitative Results:

The FGDs revealed that students who used electronic devices during lectures and study time reported that the devices helped them to take notes more efficiently and access course materials easily. However, they also reported that the devices were distracting and made it difficult for them to concentrate during lectures.

Students who did not use electronic devices reported that they were able to focus better during lectures and study time, and they found it easier to recall information and retain it in their memory.

C. Discussion of the Findings and their Significance:

The findings suggest that the use of electronic devices during lectures and study time has a negative impact on university students' academic performance. This is consistent with previous studies that have found a negative relationship between electronic device use and academic performance. The findings also suggest that the type of electronic device used may have a significant impact on academic performance, with laptops having a more negative impact than tablets or smartphones.

The findings of the FGDs suggest that electronic devices can be both beneficial and detrimental to students' learning. While they can facilitate note-taking and access to course materials, they can also be distracting and reduce students' ability to concentrate during lectures.

The significance of these findings is that they highlight the importance of regulating the use of electronic devices in the classroom to optimize students' learning outcomes.

D. Comparison of the Results with Previous Studies:

The findings of this study are consistent with previous studies that have found a negative relationship between electronic device use and academic performance. However, the findings also provide some additional insights into the impact of different types of electronic devices on academic performance. This study found that laptops had a more negative impact than tablets or smartphones, which is an important contribution to the existing literature.

V. Discussion

A. Interpretation of the Findings:

The findings of this study suggest that the use of electronic devices during lectures and study time has a negative impact on university students' academic performance. This negative impact may be due to the distractions caused by electronic devices, which can reduce students' ability to concentrate during lectures and study time. The study also found that the type of electronic device used may have a significant impact on academic performance, with laptops having a more negative impact than tablets or smartphones. This may be due to the larger size of laptops, which can be more distracting and reduce students' ability to focus.

B. Implications of the Results:

The results of this study have important implications for university students, educators, and policymakers. University students need to be aware of the negative impact of electronic device use on their academic performance and should consider limiting their use during lectures and study time. Educators should consider regulating the use of electronic devices in the classroom to optimize students' learning outcomes. Policymakers should also consider developing policies to regulate the use of electronic devices in the classroom.

C. Limitations of the Study:

One limitation of this study is the relatively small sample size. The study was conducted in one university, and the findings may not be generalizable to other universities or student populations. Another limitation is the use of self-reported data, which may be subject to bias and may not accurately reflect students' actual behavior.

D. Suggestions for Future Research:

Future research should consider using larger samples and more objective measures of electronic device use and academic performance. Future studies should also consider exploring the impact of different types of electronic devices on specific academic tasks, such as reading or writing. Longitudinal studies could also be conducted to explore the long-term impact of electronic device use on academic performance. Finally, studies could be conducted to explore the impact of different types of electronic device use on other aspects of students' lives, such as mental health and social relationships.

VI. Conclusion

In summary, this study explored the impact of electronic device use on university students' academic performance. The study found that the use of electronic devices during lectures and study time has a negative impact on academic performance. Laptops were found to have a more negative impact than tablets or smartphones. These findings have important implications for university students, educators, and policymakers.

Implications of the Study:

The study suggests that university students should limit their use of electronic devices during lectures and study time to optimize their academic performance. Educators should consider regulating the use of electronic devices in the classroom to enhance students' learning outcomes. Policymakers should consider developing policies to regulate the use of electronic devices in the classroom to promote academic success.

Recommendations for Practice and Policy:

Based on the findings of this study, we recommend that university students limit their use of electronic devices during

lectures and study time to enhance their academic performance. We also recommend that educators develop policies to regulate the use of electronic devices in the classroom to optimize students' learning outcomes. Policymakers should consider developing regulations to limit the use of electronic devices in the classroom to promote academic success.

In conclusion, this study highlights the negative impact of electronic device use on university students' academic performance. The findings suggest that limiting the use of electronic devices during lectures and study time can enhance academic performance. The study has important implications for university students, educators, and policymakers and provides recommendations for practice and policy to promote academic success.

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