THE FEATURES OF GOOGLE DRIVE FOR EFFECTIVE STUDENTS' LEARNING PURPOSE

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APPROVAL

"I hereby declare that I have read and go through this thesis and it is adequate in termsof scope and quality which fulfill the requirements for the award Bachelor of Technology Management (Technology Innovation) with Honours"

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DECLARATION OF ORIGINAL WORK

I hereby declare that this thesis with the title

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is the result of my own research except as cited in references.

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DEDICATION

This research is dedicated to my wonderful family, whose constant love, support, and encouragement have served as my greatest source of strength and inspiration during this journey. Thank you, parents, for your unending sacrifices, advice, and prayers. Your belief in. I have served as a constant source of motivation. My teachers and mentors have provided essential advice and direction. I sincerely appreciate your dedication and support. Finally, to all students who strive for academic achievement, I hope this research is a useful resource for improving your learning experiences.

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While I acknowledge the imperfections of this research, I am open to constructive criticism and suggestions for improvement. It is my sincere hope that this study contributes positively to the field of education, particularly in leveraging Google Drive's features for effective learning.

Once again, heartfelt thanks to everyone who supported me in this endeavor. Your contributions have been invaluable, and I am deeply grateful for your help and encouragement.

ABSTRACT

This quantitative study investigates the impact of various features of Google Drive (students' collaboration, sharing files, data encryption, synchronizing, and file storage) on student learning effectiveness. Data was collected from 171 undergraduate students in Universiti Teknikal Malaysia UTeM and multiple regression analysis was used to assess the relationships between these variables. The findings revealed that students' collaboration, sharing files, data encryption, and file storage had a significant positive effect on learning effectiveness while synchronizing did not show a statistically significant relationship. These results emphasize the importance of collaborative and secure learning environments in enhancing student engagement and academic performance. The study concludes that integrating more collaborative and secure features into platforms like Google Drive can improve educational outcomes. It also suggests further research into the potential role of synchronization in learning effectiveness.

Keywords: Google Drive, student learning, features, effectiveness, quantitative research, Students Collaboration, Sharing Files, Data Encryption, Synchronizing, File Storage Student Learning Effectiveness

ABSTRAK

Kajian kuantitatif ini bertujuan untuk menyelidik impak ciri-ciri Google Drive terhadap keberkesanan pembelajaran pelajar. Dalam dunia pendidikan yang semakin bergantung pada teknologi, platform seperti Google Drive menjadi alat penting untuk meningkatkan pengalaman pembelajaran dalam talian. Penyelidikan ini menggunakan pendekatan kuantitatif untuk menganalisis hubungan antara lima ciri Google Drive kolaborasi pelajar, perkongsian fail, penyulitan data, penyegerakan, dan penyimpanan fail terhadap keberkesanan pembelajaran pelajar. Data diperoleh daripada soal selidik yang diedarkan kepada pelajar yang menggunakan Google Drive dalam proses pembelajaran mereka. Analisis regresi berganda menunjukkan bahawa ciri-ciri seperti kolaborasi pelajar, perkongsian fail, penyulitan data, dan penyimpanan fail mempunyai hubungan yang signifikan dengan keberkesanan pembelajaran. Walau bagaimanapun, penyegerakan tidak memberi impak yang signifikan. Penemuan ini menunjukkan bahawa ciri-ciri tertentu Google Drive memainkan peranan penting dalam meningkatkan keberkesanan pembelajaran pelajar. Kajian ini memberi pandangan berharga mengenai cara teknologi boleh digunakan untuk menyokong dan meningkatkan pembelajaran pelajar.

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CHAPTER 1

INTRODUCTION

1.1 Background of The Study

In today's digital age, technology has become an integral part of education, revolutionizing how students learn and interact with information. Raja and Nagasubramani (2018). Among the myriad tools available, Google Drive stands out as a versatile platform offering various features designed to facilitate collaboration, streamline workflow, and organize educational materials (Curabba, 2016; Shakor, 2022). This research aims to delve into the specific features of Google Drive and its potential to enhance students' learning experiences.

While some studies have explored the general use of technology in education, few have focused specifically on the features of Google Drive and its impact on student learning. Existing research often overlooks the nuanced features of Google Drive, instead providing broad overviews or anecdotal evidence. Additionally, there is a lack of comprehensive studies that systematically examine the effectiveness of different Google Drive features in facilitating learning outcomes.

This study seeks to address these gaps by conducting a thorough investigation into the specific functionalities of Google Drive, such as document creation, sharing, collaboration, and organization. By identifying best practices and potential challenges associated with each feature, we aim to provide educators and students with actionable strategies for integrating Google Drive effectively into their learning environments. Moreover, this research endeavors to shed light on the overlooked aspects of Google Drive, offering insights that can inform educational practices and policies. Ultimately, the findings of this study can empower students to harness the full potential of Google Drive as a tool for academic success, fostering a more collaborative and organized approach to learning in the digital age.

1.2 Operational Definition

An operational definition is a concise description of how researchers will measure or manipulate a variable in a study, ensuring clarity and consistency in research methods.

1.2.1 Google Drive

Google Drive is an overview of Google's collaborative features and File Stored service. Google Drive is a cloud storage service that lets you save files online and access them from any computer, tablet, or smartphone, anywhere. You may safely upload and edit files online using Drive on your PC or mobile device. Drive also facilitates easy file editing and collaboration for other users. (Aira Geramie Reyes, 2024). Google, as described by ("Google," 2024c), acts as a gateway to accessing information across the internet. This aspect highlights Google's broader function as a search engine, enabling users to find relevant information online. By integrating Google's search capabilities with the comprehensive File Stored and retrieval functionalities of Google Drive, students can efficiently locate, organize, and utilize educational resources to enhance their learning experiences. In 1998, Larry Page and Sergey Brin launched Google, an American search engine company. Google has been a division of parent firm Alphabet, Inc. since 2015. Google is the primary search engine for the majority of Internet users, processing over 70% of all global online search requests. It is among the most well-known brands in the world. Its main office is located in California's Mountain View. Google started out as an online search engine, but these days it provides over 50 services and products for the Internet, ranging from online document creation and e-mail to tablet and smartphone software. In addition, the company's acquisition of Motorola Mobility in 2012 enabled it to offer hardware in the form of mobile phones. Along with Apple, IBM, and Microsoft, Google is regarded as one of the top four significant companies in the high-tech industry due to its extensive product portfolio and scale. The foundation of Google's success remains its original search tool, despite the company's wide range of offerings. In 2016, Google's search-based advertising accounted for nearly all of Alphabet's revenue. (Hall & Hosch, 2024).

Furthermore, Google Drive, as defined by Wigmore and Mixon (2023), is an online File Stored and retrieval service that operates on the cloud, synchronizing data across various devices and integrating with other Google services such as Google Docs, Gmail, and YouTube. This definition emphasizes Google Drive's role as a pivotal tool in the digital ecosystem, facilitating seamless access to stored information and collaboration across platforms.

Therefore, in this research, the operational definition of Google Drive encompasses its role as an online File Stored and retrieval service that synchronizes data across devices and integrates with other Google services. This definition guides the investigation into the impact of Google Drive features on student learning outcomes and academic performance, ensuring clarity and consistency in research methods.

1.2.2 Learning Effectiveness

Understanding learning as ontogenetic adaptation emphasizes the importance of environmental influences in shaping behavioral alterations prompted by experience, as described by Houwer and colleagues (2013). Cobb (2023) further elucidates learning as a lifelong process of transforming information and experience into knowledge, skills, behaviors, and attitudes, offering advancements for cognitive learning research. This perspective underscores the dynamic nature of learning, highlighting the ongoing integration of new information and experiences to enhance cognitive development and educational outcomes.

Effectiveness in learning is intricately tied to the ability to integrate new concepts and establish connections between past and present experiences. Jeyararaj (2019) outlines four key strategies for effective learning: building meaning, storytelling, observation, and participation in knowledge-generating communities. However, the efficacy of these strategies heavily relies on proficient instruction, where students benefit from high-quality guidance and support.

Aligning with this perspective, the research investigates how the features of Google Drive contribute to students' learning effectiveness by facilitating the

integration of new concepts and experiences. By exploring correlations among different features of Google Drive and analyzing their impact on students' learning outcomes, the study seeks to provide insights into how technology can enhance the learning process and promote cognitive development. Ultimately, by understanding the mechanisms through which Google Drive features influence learning effectiveness, educators can optimize their instructional practices and support students in achieving academic success.

1.3 Research Question

1. What impact do the various features of Google Drive have on students' learning outcomes and academic performance?
2. What correlations exist among different features of Google Drive, and how do they interact with each other?
3. What specific features of Google Drive are most critical in facilitating effective student learning, and how do they compare to other features in terms of their impact?

1.4 Research Objective

1. To investigate the extent to which the features of Google Drive impact students' learning effectiveness.
2. To analyze the correlations among different features of Google Drive to understand their interrelationships.
3. To determine the dominant feature of Google Drive that significantly contributes to enhancing student learning effectiveness.

1.5 Problem Statement

Google Drive offers a plethora of features designed to enhance students' learning experiences. With its cloud-based storage, collaborative tools, and accessibility across devices, Google Drive presents numerous advantages for students in managing, sharing, and collaborating on educational materials. Shakor (2022). These features have the potential to streamline workflow, facilitate group projects, and promote organization Armand (2023), ultimately contributing to more efficient and effective learning outcomes for students.

Despite the benefits that Google Drive offers, there exist challenges and limitations in its utilization for educational purposes. Any application, service, or tool out there comes with limits as well. (Weis, 2021). One prominent issue is the lack of comprehensive understanding among students regarding the diverse functionalities of Google Drive and how to effectively leverage them for learning. Additionally, there may be barriers to access or technical difficulties that hinder students from fully utilizing Google Drive's features to support their academic endeavors. (Prasertsith et al. ,2016). Addressing these challenges is crucial to maximizing the educational potential of Google Drive for student learning.

In addition to these challenges, it is important to acknowledge the disadvantages of Google Drive. While it offers many benefits, there are also drawbacks such as concerns about data security and privacy (Quick and Choo, 2014), the potential for file versioning issues, and limitations in offline access. These disadvantages highlight the need for a comprehensive understanding of Google Drive's capabilities and limitations in educational settings, ensuring that students and educators can make informed decisions about its use.

Hence, the study aims to employ a quantitative research method to assess the impact of Google Drive's features on students' learning outcomes and academic performance. The research will involve 370 respondents from the University Technical Malaysia Melaka (UTeM). The expectation is to quantify the extent to which Google Drive's features contribute to effective learning, identify correlations among its various features, and determine which specific features are most critical for enhancing student learning.

1.6 Significant of The Study

This study is important because it helps us understand how Google Drive can help students learn better. In today's world, where technology is so important for learning, knowing how to use tools like Google Drive well is crucial. By looking at the different things Google Drive can do and how they affect student learning, this research fills a gap in what we know about technology in education. It gives teachers, students, and people who make decisions about education valuable information about how to use Google Drive effectively in schools.

This study also adds to what we know by giving us real evidence about how well Google Drive works for students. By carefully looking at what Google Drive can do and how it helps students learn, this research helps us understand more about how technology can support education. The things we learn from this study can also help other researchers make better tools for learning with technology.

But most importantly, this study is helpful for students and teachers in real life. By showing what works best and what challenges there are with Google Drive, this research helps students use technology in smarter ways for school. Teachers can also use what we find out to make their lessons more interesting and to help students work together better. So, the research doesn't just help people in schools, but it helps everyone who wants to learn and teach better using technology.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the focus is on understanding how different aspects of Google Drive affect students' learning. Information was gathered from various sources like education journals, tech magazines, and research papers to identify the important parts of Google Drive for this study. Past studies and theories were reviewed to ensure only the most relevant points were included. Then, the same method was used to figure out what questions to ask in the research surveys. Additionally, our own thoughts were added to the discussion.

The features of Google Drive, such as working together on documents, sharing files, and editing, were carefully selected based on what previous research showed. These features are what are called independent variables because they can change and influence learning. On the other hand, students' learning effectiveness, which includes things like grades and how well they remember what they learn, is the dependent variable. Ideas from different studies were combined to understand these variables better.

Once the features and their details were decided, questions were formulated for the surveys to get the best information. Care was taken to think about both what others have found and what is thought to be important. Additionally, our own opinions were added to the discussion to make it richer.

With all this information, a framework was created to guide the research. This framework helps understand how the different parts of Google Drive affect students' learning. In Chapter 3, this framework will be used to test some ideas about how Google Drive features impact learning. Through this research, the aim is to demonstrate how Google Drive can make learning better for students.

2.2 Features Of Google Drive

Google Drive is a versatile tool that offers a range of functionalities to enhance students' learning effectiveness. These features include cloud storage, collaborative document editing, mobile accessibility, and the ability to publish and share work. (Moreno-Guerrero et al., 2020; Rossiman et al., 2021). These functionalities enable students to store, access, and edit learning materials remotely, collaborate on group projects, receive immediate feedback, and engage in self-guided courses.

The cloud storage feature allows students to store and access files such as pictures, documents, PDFs, designs, drawings, recordings, videos, and more in any place where the internet is accessible. (Rossiman et al., 2021) This feature provides a centralized location for storing learning materials, ensuring that students can access them from any device, anywhere, and at any time.

Collaborative document editing is another key feature of Google Drive, enabling multiple users to work on the same document simultaneously. (Moreno-Guerrero et al., 2020; Rossiman et al., 2021) This feature enhances peer-to-peer interaction, fostering a sense of learning community among students and improving teaching efficiency by allowing teachers to monitor learning more effectively.

Mobile accessibility is also a crucial feature of Google Drive, allowing students to create documents on any device, even their mobile phone, and then upload them to the Drive. This feature enables students to work on their assignments from anywhere, at any time, promoting flexibility and accessibility in their learning process.

The ability to publish and share work is an essential feature of Google Drive, enabling students to receive immediate feedback and engage in self-guided courses. This feature facilitates learning by allowing students to benefit from the opinions of their peers, access peer-to-peer support, and receive constructive criticism and feedback when it matters the most.

Google Drive's features serve as the independent variable in this study, impacting students' learning effectiveness. The study by Amin (2020) highlighted how Google Docs, a component of Google Drive, fosters a sense of learning community among students, emphasizing the importance of these features in enhancing the educational experience. (Moreno-Guerrero et al., 2020) For this study, the four independent variables for the features of Google Drive are namely Students Collaboration, Sharing Files, Synchronizing, encryption, and File Stored. (Keeler, 2023).

2.2.1 Students Collaboration

Google Drive's Students Collaboration feature allows multiple users to work together on a single document, spreadsheet, or presentation simultaneously. This feature enhances communication and collaboration among team members, enabling them to share ideas, provide feedback, and make real-time changes to the document. By facilitating teamwork, Google Drive's Students Collaboration feature can increase productivity, improve learning outcomes, and foster a sense of community among students. Technology now allows students to collaborate online without converting, saving both time and money. One suggested tool to help Google Drive facilitate collaboration and is freely available to university students. (Tukur,2021). As such, Students Collaboration comprises five variables communication, feedback, accessibility, version control, and security.

2.2.1.1 Communication

Google Drive's real-time collaboration feature allows multiple users to work together on a single document, spreadsheet, or presentation simultaneously. This feature enhances communication and collaboration among team members, enabling them to share ideas, provide feedback, and make real-time changes to the document. Google Drive's Suggesting mode, which is similar to the Track Changes feature in Microsoft Office, allows each collaborator to make changes while giving the other

collaborators a chance to review the changes before making them permanent. Social media may improve information storage and sorting, as well as provide faster communication options. It also has other benefits. Google Drive is mostly used for media-based teaching and learning. (Tukur,2021). By improving communication, Google Drive helps students to work more efficiently and effectively on group projects, which can lead to better learning outcomes and a more cohesive learning experience.

2.2.1.2 Feedback

Feedback plays a crucial role in Students Collaboration, and Google Drive's commenting feature facilitates timely and constructive feedback on specific parts of a document. This functionality empowers team members to address issues promptly, refine their work, and enhance the overall quality of their collaborative efforts. The ability to provide and receive feedback efficiently contributes to improved learning outcomes and fosters a culture of continuous improvement within the team. Among many technologies, Google Drive is a learning tool that helps implement a student-centered approach in a collaborative learning environment. Document sharing and comments give students the opportunity to receive immediate feedback. This will help students in Students Collaboration. (Abubakar,2019). By leveraging this feature, students can better manage their collaborative projects and improve their academic performance through continuous refinement and enhancement of their work.

2.2.1.3 Accessibility

Accessibility is another key aspect of Google Drive's Students Collaboration feature, as its cloud-based storage system enables users to access documents from any device. The Drive for Desktop feature further enhances accessibility by integrating Google Drive seamlessly with users' desktop folders, simplifying file management, and enabling remote collaboration. This accessibility ensures that team members can work together effectively, regardless of their physical location,

promoting flexibility and efficiency in collaborative tasks. Google Drive is classified as a cloud storage solution. You can upload your files here and access them from any device. However, it is not all it provides. Google Drive also works with Google Docs, Google Sheets, and Google Slides. This program allows you to create new files. It also allows you to share the specified files and folders with others. Google Drive also connects with Google Groups. Having said that, you can create groups in which everyone has access to alter the folders and files in your Google Drive. (Goodwin, 2024).

2.2.1.4 Version Control

In terms of version control, Google Drive's robust version history feature allows users to track changes made to documents, ensuring that everyone is working on the most up-to-date version. This feature provides transparency and accountability within the team, allowing for easy monitoring of modifications and facilitating collaboration on evolving projects. By maintaining a detailed record of document changes, Google Drive enhances the accuracy and integrity of collaborative work, promoting effective Students Collaboration and project management. Version control lowers confusion eliminates duplication of work, and guarantees that the most recent information is easily available. (Armand, 2023). This capability supports students in managing their collaborative learning tasks more effectively, ultimately contributing to improved learning outcomes and a more organized approach to academic projects.

2.2.1.5 Security

Google Drive prioritizes security through features like two-factor authentication and access controls, safeguarding sensitive information and ensuring that only authorized users can access confidential documents. By implementing stringent security measures, Google Drive protects data integrity and confidentiality, instilling trust among team members and fostering a secure collaborative environment. These security features contribute to a safe and reliable platform for

Students Collaboration, enabling users to work together with confidence and peace of mind. For security, Google Drive Data Encryptionfiles in motion are protected using 256-bit SSL/TLS encryption, while those at rest are encrypted with 128-bit AES keys. (Ferdy, 2017). By ensuring the security of collaborative documents, Google Drive helps maintain a trustworthy environment where students can focus on enhancing their learning outcomes without concerns about data breaches or unauthorized access.

2.2.2 Sharing Files

Google Drive, a powerful Web-based file-sharing application, has transformed how millions of students communicate and manage files in their courses. The app enables users not only to securely store, share, and edit documents in various formats, such as documents, spreadsheets, presentations, forms, drawings, and photos. This feature enables real-time document editing and saves changes instantly. Google Drive supports over 20 file formats, allowing students to open files in the browser without the need for installed applications. Students can easily copy and save files shared by the instructor to their own drives for future use. File sharing systems are one of these technologies, and they can be used to manage and deliver course materials, as well as coordinate virtual teams. The findings revealed that students saw Google Drive as an easy-to-use and useful system for storing and sharing course materials, and they preferred its use in university classrooms. (Sadik, 2016). As such, Sharing Files comprises five variables which are specific individuals (Rish et al., 2015), groups (Sadik, 2016), publicly, (Slavkov, n.d.), and sharing options (Basilaia et al., 2020).

2.2.2.1 Specific Individuals

Google Drive allows users to share files with specific individuals, which provides a level of control and security over the shared files. This feature enables users to share files with specific collaborators, ensuring that only the intended recipients have access to the file. By sharing files with specific individuals, users can ensure that sensitive or confidential information is only shared with the necessary parties, reducing the risk of unauthorized access or data breaches. (Admin & Admin). This capability directly supports students' learning by allowing them to securely collaborate on sensitive academic materials and projects with designated peers or instructors.

2.2.2.2 Groups

Google Drive's ability to share files with groups simplifies the sharing process for teams or classes. By sharing files with groups, users can avoid the need to send individual invitations to each collaborator. This feature is particularly useful for collaborating with large groups, as it allows users to share files with multiple people at once, reducing the time and effort required to manage file sharing. (Admin & Admin, 2015). This functionality enhances collaborative learning by making it easier for students to work together on group assignments and projects without the administrative burden of managing multiple individual shares.

2.2.2.3 Publicly

Google Drive allows users to share files publicly, which can be useful for sharing documents or presentations with a wider audience. By making a file public, users can share it with anyone who has the link, regardless of whether they have a Google account or not. This feature is useful for sharing files with a wider audience, such as in a public presentation or online course. (Admin & Admin, 2015). This capability supports educational activities by enabling students to disseminate their

work and academic resources to a broader audience, enhancing visibility and accessibility.

2.2.2.4 Sharing Option

Google Drive provides various sharing options, such as view-only or edit access. This feature allows users to control the level of access that collaborators have to their files, ensuring that only authorized users can make changes or leave comments. For example, users can share a file with view-only access, which allows collaborators to view the file but not make any changes. Alternatively, users can share a file with edit access, which allows collaborators to make changes and leave comments. (Admin & Admin, 2015). This flexibility in sharing options supports effective collaboration by allowing students to tailor access based on their specific needs and roles within a project.

2.2.2.5 Access Controls

Google Drive offers access controls, such as the ability to set expiration dates or require sign-in with a Google account. This feature enables users to manage access to their files, ensuring that only authorized users can view or edit the file. For example, users can set an expiration date for a shared file, which automatically revokes access to the file after a certain period of time. Alternatively, users can sign in with a Google account to access a shared file, which ensures that only users with a Google account can view or edit the file. (Admin & Admin, 2015). These access controls enhance security and manageability, providing students with a secure environment for sharing academic work and collaborating with peers.

2.2.3 Encryption

Data Encryption is the most effective way to achieve data security It is the process in which plain text converts into cipher text and allows only authorized people to access the sender's information. (Journals, 2015) Google Drive's Data Encryption feature is a critical aspect of its security and privacy capabilities, ensuring that user data remains confidential and protected. This feature uses advanced Data Encryption algorithms to secure files both in transit and at rest, providing an additional layer of security to prevent unauthorized access or data breaches.

Data Encryption is a process of converting plain text into a coded format that can only be accessed with a decryption key. Google Drive uses Data Encryption to secure files during transfer from the user's device to Google's servers and while the files are stored on Google's servers. This ensures that even if the files are intercepted during transfer or accessed by unauthorized individuals, they will be unreadable without the decryption key.

Google Drive's Data Encryption feature is particularly important for businesses and organizations that handle sensitive data, such as financial or personal information. By using encryption, these organizations can ensure that their data is protected and secure, reducing the risk of data breaches and protecting their customers' privacy.

In addition to encryption, Google Drive also offers other security features, such as two-factor authentication, access controls, and audit logs. These features work together to provide a comprehensive security solution for user data, ensuring that it remains confidential and protected at all times.

Google Drive's Data Encryption feature is a critical component of its security and privacy capabilities, providing an additional layer of protection for user data and ensuring that it remains confidential and secure. By using encryption, Google Drive can prevent unauthorized access, data breaches, and other security threats, ensuring that user data remains safe and secure at all times. The variables for the Data Encryption are advanced encryption, data security, privacy protection, and comprehensive security.

2.2.3.1 Advanced Encryption

Google Drive is a data security pioneer, using strong Data Encryption methods to protect files in transit and at rest. Data Encryption is the foundation of Google Drive's security architecture, protecting data from unwanted access and hostile breaches. Google Drive uses strong Data Encryption algorithms such as AES (Advanced Data Encryption Standard) to ensure that data is protected both while transmission over the internet and while stored on its servers. This multi-layered Data encryption strategy not only reduces the risk of data interception in transit, but it also strengthens the confidentiality of stored information, protecting them from prospective breaches or unwanted access attempts.

The value of Data Encryption in cloud security cannot be emphasized. As enterprises progressively shift to cloud-based storage solutions, maintaining data integrity and confidentiality becomes critical. Data Encryption protects against a variety of cyber dangers, including data breaches, ransomware attacks, and insider threats. (Mulyadi, 2017) conducted a comprehensive study on the security of cloud storage services, which confirmed the critical significance of Data Encryption in strengthening the security posture of cloud-based platforms. Cloud service providers such as Google Drive create confidence in consumers by encrypting data at rest and in transit, ensuring that their sensitive information is protected from prying eyes and possible enemies.

2.2.3.2 Data Security

Data Encryption IN Google Drive enhances data security by preventing unauthorized access or data breaches and safeguarding sensitive information from potential threats. Google Drive automatically encrypts data at rest using Google-managed Data Encryption keys, which are handled by Google and encrypted using the Advanced Data Encryption Standard (AES) algorithm, AES-256. (Data Encryption Methods, n.d.). This ensures that data stored in Google Cloud is protected against malicious attacks or breaches which might lead to compromising the security of the entire project or organization.

2.2.3.3 Privacy Protection

Data Encryption ensures that user data remains confidential and protected, maintaining privacy and preventing unauthorized access to files. According to a study on the security of cloud storage services, Data Encryption is a crucial mechanism for enhancing the privacy of data stored in the cloud. (Mulyadi, 2017). Google Docs uses leading Data Encryption technologies like HTTPS and Transport Layer Security to protect user data, ensuring that it remains confidential and secure. (Menon, 2023).

2.2.3.4 Comprehensive Security

Data Encryption is a critical component of Google Drive's security and privacy capabilities, providing an additional layer of protection to ensure that user data remains secure and confidential. Google Docs has a wide range of security elements that keep user data highly secured, including the ability to disable options to download, print, and copy for commenters and viewers. (Menon, 2023). This ensures that user data remains secure and protected, providing peace of mind for users who store sensitive information in Google Drive.

2.2.4 Synchronizing

Google Drive's Synchronizing feature allows users to automatically synchronize files and folders across multiple devices, ensuring that all changes are up-to-date and accessible. This feature enables users to work on the same document from different devices, making it an ideal tool for collaboration and remote work. Synchronizing is an essential feature for Google Drive, as it enables users to access their files from any device with an internet connection. This feature ensures that users have access to the most recent version of their files, reducing the risk of version conflicts or data loss.

Google Drive's Synchronizing feature is also highly customizable, allowing users to choose which folders to synchronize and how often to perform synchronization. This flexibility enables users to tailor the Synchronizing process to their specific needs, ensuring that they have access to the most relevant and up-to-date files. The Synchronizing feature in Google Drive is also highly secure, as all data is encrypted during transmission and storage. This ensures that sensitive information remains confidential and protected, even when it is being synchronized across multiple devices.

In addition to its Synchronizing capabilities, Google Drive also offers real-time collaboration and editing, making it an ideal tool for team projects and group work. This feature allows multiple users to work on the same document simultaneously, with changes appearing in real-time for all collaborators. Overall, Google Drive's Synchronizing feature is a critical component of its functionality, providing users with a seamless and secure way to access and synchronize their files across multiple devices. By enabling real-time collaboration and editing, Google Drive also promotes effective communication and collaboration among team members, making it an essential tool for remote work and team projects. As such Synchronizing comprises two variables which are real-time synchronization and automatic backup. (Aviv et al., 2016).

2.2.4.1 Real-time Synchronization

Real-time synchronization in Google Drive ensures that changes made to files are instantly updated across all devices and platforms, facilitating seamless collaboration and access to the most current version of documents. Google Drive's synchronization feature allows for two-way synchronization of selected folders, enabling users to run synchronization in any direction they desire, promoting efficient file management and collaboration. Google Drive is a free Google software that offers 15 gigabytes of cloud storage and an integrated sharing and Synchronizing service. There were more than 240 million Google Drive users globally as of September 2014.

The Google Docs (sub)app provides access to Google Drive's writing features, which include document creation, storage, synchronous and asynchronous sharing, editing, and commenting. Revision histories allow users to view previous versions of a document they own or share with others. Other features include document-specific real-time chat and a variety of distribution options for different audiences and platforms. (Slavkov, 2015). This real-time synchronization enhances students' ability to work collaboratively on academic projects, ensuring that all participants have immediate access to the most current version of their work, which is crucial for effective teamwork and learning.

2.2.4.2 Automatic Backup

The automatic backup functionality built into Google Drive is a key component of data resilience and continuity planning. In the case of hardware failures, system crashes, or other unforeseen tragedies, customers can be confident that their data is safe and accessible thanks to Google Drive's cloud-based architecture. This inbuilt redundancy reduces the danger of data loss and downtime, allowing users to seamlessly resume their workflows with no disruption or delays.

Google Drive's automated backup feature provides unrivaled data accessibility across devices and operating systems. Whether accessing files from a desktop computer, laptop, tablet, or smartphone, users may synchronize their data across numerous platforms, guaranteeing continuity and consistency in their digital experiences. This ubiquitous access overcomes the boundaries of traditional storage systems, allowing users to collaborate, share, and interact with their data at any time and from any location.

Google Drive's automatic backup capability is a pillar of modern data management, combining strong security standards with unrivaled accessibility. By automating the backup process, Google Drive enables users to proactively protect their digital assets while embracing a seamless and linked digital world. According to Aviv et al. (2016), the convergence of automatic backup, file synchronization, and remote access capabilities makes personal cloud storage services such as Google

Drive important tools for modern digital resilience and productivity. This feature supports students by ensuring their academic work is continuously backed up and accessible, thereby minimizing the risk of data loss and enabling uninterrupted academic progress.

2.2.5 File Stored

Google Drive is a cloud-based File Stored service that provides users with a centralized location to store, access, and share various types of files. It is part of the Google Workspace service, which includes other productivity tools such as Gmail, Google Docs, and Google Sheets. Google Drive offers 15 GB of free storage space to all users, and users can purchase additional storage if needed. (Stagnitto, 2024: (Ibnutama et al., 2019) Google Drive is particularly useful for students, as it provides them with a large amount of storage space to store their academic files, such as documents, presentations, and videos. Students can access their files from any device with an internet connection, making it easy to work on assignments and projects from anywhere.

According to the University of Cambridge, Google Drive also offers collaboration features, such as shared drives, which allow students to work together on files and projects in real-time. Shared drives are secure, easy-to-manage spaces where teams can store and access their work. Moreover, Google Drive's version control feature allows students to look at older versions of their documents, sheets, and slides, ensuring that they don't lose any important work. Google Drive also retains versions for 30 days or the most recent 100 versions, providing students with a safety net in case they need to revert to an earlier version of a file. As such File Stored comprises four variables which are storage capacity, file types, accessibility, and collaboration.

2.2.5.1 Storage Capacity

Google Drive is an excellent solution for both individuals and businesses, providing a generous 15 gigabytes of free storage space (Stagnitto, 2024; Ibnutama et al., 2019). This allocation is more than adequate for most users and serves as the foundation for digital organization and accessibility. Google Drive's adaptability extends beyond simple storage; it serves as a reliable repository for a wide range of file kinds, from important documents to multimedia presentations, photos, videos, and more. This level of interoperability guarantees that users can easily centralize their digital assets, streamlining workflow and improving cooperation.

Google Drive meets the different needs of its users by offering alternatives for increased storage capacity through prepaid plans geared to individual or business needs. This scalable strategy enables customers to grow their storage capacity in response to changing needs, whether it's preserving large video libraries, protecting key business documents, or supporting seamless collaboration across distant teams.

The importance of this flexibility cannot be emphasized. In an era marked by exponential data expansion and the prevalence of digital information, having access to secure and scalable storage solutions is critical. Google Drive's solid infrastructure and user-friendly interface reduce the stress of storage limits, allowing users to focus on productivity and innovation without fear of data scarcity or loss. This storage capacity supports students by providing sufficient space for their diverse academic needs, facilitating an organized and efficient approach to managing their learning materials.

2.2.5.2 File Types

The ability to store a wide range of file types, including documents, presentations, spreadsheets, images, videos, and audio files, makes Google Drive a versatile platform for university students. it supports different types of file formats (Sadik, 2016). Students can use Google Drive to store and access various types of academic content, such as research papers, lab reports, lecture slides, and multimedia projects. This flexibility allows students to seamlessly integrate different types of

digital resources into their studies and research, enhancing the quality and depth of their academic work. This broad support for file types ensures that students can manage all their academic resources in one place, streamlining their study process and enhancing their learning efficiency.

2.2.5.3 Accessibility

The ability to access files from any device with an internet connection is particularly beneficial for university students, who often need to work on assignments and projects from multiple locations, such as the library, computer labs, or even while commuting. This feature ensures that students can always have their academic files at their fingertips, enabling them to stay productive and engaged with their studies, even when they are away from their primary device. Users can access the data online without downloading it, making it more convenient and efficient. The internet has made digital data storage technology accessible to all users. Cloud storage provides numerous benefits for consumers. You can store and access files immediately in the cloud without downloading them. (Chandra & Hartono, 2018). This accessibility feature supports students by allowing them to engage with their academic materials from any location, thus enhancing their ability to study and collaborate effectively regardless of their physical surroundings.

2.2.5.4 Collaboration

Google Drive's shared drives feature is invaluable for university students who need to collaborate on group projects and assignments. This feature allows students to work together in real-time, share resources, and provide feedback on each other's contributions, fostering a more collaborative and engaging learning environment. The ability to collaborate effectively on academic work can enhance students' critical thinking, communication, and teamwork skills, which are highly valued in the academic and professional spheres. (Nithya et al., 2017).

2.3 Student Learning Effectiveness

Student learning effectiveness is the essential dependent variable influenced by Google Drive's multifarious capabilities. This study conducts a thorough investigation of how the many capabilities inherent in Google Drive have a significant impact on students' learning results, engagement levels, and overall educational experiences.

Google Drive emerges as a dynamic catalyst for educational enrichment, providing a set of tools and capabilities that extend beyond traditional learning boundaries. This study's empirical examination attempts to explicate Google Drive's transformative effects on student learning trajectories, as well as its function as a cornerstone of modern pedagogical approaches.

The integration of Google Drive into educational frameworks opens up a plethora of alternatives for students to supplement their academic activities. Students can actively participate in cooperative learning activities by utilizing its collaborative features, including real-time document editing and shared workspaces, which enable a dynamic interchange of ideas and viewpoints. This collaborative mindset not only fosters a sense of community in the classroom, but it also promotes critical thinking and collaborative problem-solving skills.

Google Drive's seamless accessibility promotes fast feedback loops, allowing educators to provide timely assistance and support to students throughout their learning journey. This cyclical feedback system not only improves comprehension but also instills in learners a sense of accountability and self-reflection, motivating them toward ongoing progress and subject mastery.

Google Drive acts as a conduit for ubiquitous learning, providing students with unprecedented freedom in accessing instructional materials from any location with internet access. This ubiquitous access frees students from the confines of traditional classroom settings, allowing them to engage with course information at their own pace and convenience. Google Drive promotes a culture of continual learning and knowledge distribution, whether it's reading lecture notes while commuting or collaborating on group projects from different places.

The empirical findings support Google Drive's revolutionary impact on student learning outcomes. Slone and Mitchell (2014) produced seminal research that emphasizes the critical significance of online collaboration technologies, such as Google Docs, in creating engagement and student-centered learning settings. Slone and Mitchell found a link between the use of collaborative tools and higher student accomplishment, confidence, and contentment in educational environments, based on empirical observation and qualitative study.

2.3.1 Engagement in Learning Activities

Student engagement in education refers to the level of focus, curiosity, enthusiasm, optimism, and passion that students exhibit during instruction. It also encompasses the degree of motivation that students have to learn and advance in their education. The idea behind "student engagement" is generally that learning tends to suffer when students are bored, disengaged, apathetic, or in some other way not interested in what they are studying. On the other hand, learning tends to improve when students are curious, interested, or inspired. Educators frequently state that their teaching objectives are to increase or strengthen student involvement. (Sabbott, 2016).

Learning activities are projects or exercises that are carried out during the educational process with the goal of boosting understanding and assisting students in learning new concepts. These exercises are designed to encourage pupils to actively participate in a learning program. Although their nature may vary between exercises, discussions, projects, and online activities, what unites them is that they are all deliberately structured to accomplish the goals of the overall learning program.

2.3.2 Knowledge Retention

Knowledge is the familiarity, awareness, or comprehension of someone or something, including facts, information, descriptions, or abilities, that is gained from education or experience by seeing, learning, or experiencing. Knowledge retention refers to our ability to retain information or abilities obtained over time. Simple, really. This extends beyond short-term memory. Anyone can do it. Instead, the emphasis is on encoding knowledge in our long-term memories so that we may access it as needed. Knowledge retention is the process of remembering or recalling certain knowledge, processes, or talents that were previously learned. However, retaining differs from knowledge transfer. Although retention is the ability to recollect information exactly as it was learned, knowledge transfer is the process of recalling information and applying it in new settings. Retention is necessary before information transfer can occur. (Todericiu & Alexandra, 2019).

2.3.3 Resource Utilization

The term "resources" refers to the tools, materials, equipment, environments, and people with whom learners engage to support learning and performance. The sorts of resources (particularly, technological resources) and how they are used (appropriately) distinguish what educational technologists perform from similar efforts in other sectors. (Betrus, 2014). Utilization of resources is an essential component of educational institution management, ranging from preschools to colleges. Resources are recognized as making a vital contribution to the improvement of the educational system. (Kapur, 2019). Numerous benefits that enhance the efficacy of learning are provided by using Google Drive to manage student-centered learning. (Suryaman et al., 2018).

2.3.4 Participation in Collaborative Learning

Student Participation is an assessment of a student's performance in a course that is not part of their regular assessments. Student participation could be evaluated based on engagement in class discussions, engagement in online conversations, and student behavior in group settings. According to the Science, health and medical journals The phrase "collaborative learning" refers to educational practices that involve students or teachers working together on intellectual tasks. Students usually work in groups of two or more, seeking mutual understanding. Collaborative learning marks a substantial departure from the traditional teacher-centered or lecture-centered environment in college courses. Collaborative classrooms combine lecturing, listening, and note-taking with student debate and active participation. Course materials. Collaborative learning teachers view themselves as experts in designing intellectual experiences for pupils, rather than simply transmitting knowledge to them. Solutions, meanings, or developing a product. Collaborative learning activities typically involve students exploring or using apps.

2.3.5 Confidence in Learning

Confidence in learning is an important component of student achievement because it allows people to attain their full potential and overcome academic obstacles with resilience. Google Drive, with its diverse features and collaboration capabilities, is critical in building student confidence in educational settings. Google Drive enables students to efficiently interact with digital resources by providing smooth accessibility and user-friendly interfaces, developing a sense of mastery and competence in their technological talents.

Furthermore, Google Drive's collaborative nature creates a helpful learning environment in which students may use peer criticism and validation to boost their confidence in their ideas and contributions. Google Drive fosters a sense of community and belonging among students by allowing for real-time collaboration and peer contact, strengthening their confidence in their talents and promoting a pleasant learning experience. The rapid feedback systems built into Google Drive

allow students to track their progress and receive timely help, fostering a culture of continual improvement and self-reflection. Students gain a detailed understanding of their strengths and areas for improvement by participating in iterative feedback loops and self-assessment activities, which boosts their confidence in their capacity to overcome obstacles and achieve academic success. This reciprocal association between confidence and academic accomplishment demonstrates Google Drive's revolutionary potential in enabling students to embrace learning with conviction and perseverance. (Abdullah et al., 2019).

2.4 Theoretical Framework

Theories aim to explain, forecast, and criticize existing knowledge while adhering to critical assumptions. A theoretical framework is a structure that supports a research theory. The theoretical framework presents and describes the theory that explains why the research problem under consideration occurs. (Zaheer, 2014). The theoretical framework for this study as show as Figure 2.1 is based on the relationship between Google Drive features (independent variable) which consist students collaboration, sharing files, data encryption, synchronizing and file stored and student learning effectiveness (dependent variable). According to this concept, Google Drive's different features and features may have significant effects on and improve students' learning effectiveness.

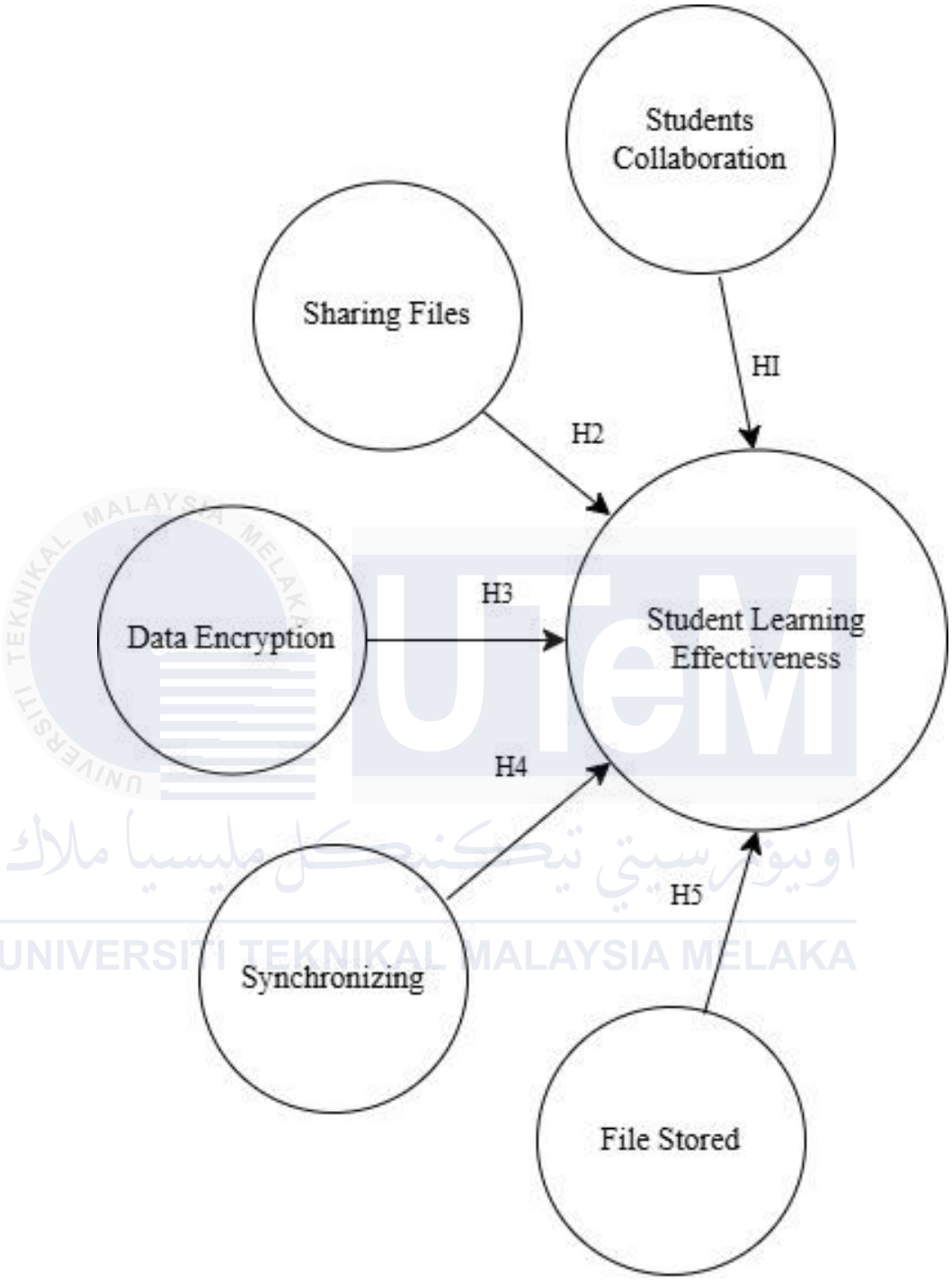

Figure 2.1: Theoretical Framework

2.5 Hypothesis

H1: There is a significant relationship between Students Collaboration and student learning effectiveness.

H2: There is a significant relationship between Sharing Files and student learning effectiveness.

H3: There is a significant relationship between Data Encryption and student learning effectiveness.

H4: There is a significant relationship between Synchronizing and student learning effectiveness.

H5: There is a significant relationship between File Stored and student learning effectiveness.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is a collection of systematic techniques used in research. This is merely a research guide and how it is conducted. It describes and analyses methodologies, sheds more light on their limitations and resources, clarifies their assumptions and consequences, and compares their potential to the twilight zone at the frontiers of knowledge. (Igwenagu, 2016). A research methodology defines the methods and approaches employed to locate and evaluate data of a certain study subject. It's a method by which scientists plan their investigation to enable them to use the chosen research tools to accomplish their goals. It covers every crucial facet of research, such as the overarching framework for the study as well as the methodologies used for data collecting, analysis, and research design. These principles can aid in your understanding of research techniques, but you also need to appreciate the significance of selecting the appropriate methodology. A research methodology produces conclusions that are supported by science and lend credibility to the study. In addition, it offers a thorough schedule that aids in maintaining researchers' focus and streamlines the procedure. The reader can comprehend the strategy and procedures utilized to arrive at results by understanding the researcher's methodology. Establishing an effective research methodology gives advantages such as there is sufficient data for other researchers to duplicate the study and when researchers are criticized, they can point to the methodology and defend their position.

3.2 Research Design

A research design is a specific plan, structure, strategy, and inquiry that aims to determine a research topic and manage variation. (Thakur, 2021). In this study, the research design plays a crucial role in guiding the process of gathering information and addressing the research questions effectively. Acting as a blueprint for the entire research endeavor, it provides a structured approach to conducting the study.

Research design is essentially a roadmap that outlines the methodology for data collection, analysis, and interpretation. Much like a roadmap guides travelers in reaching their destination, the research design guides researchers in navigating through the research process to achieve the study's objectives.

Interpreting the results of the data analysis is crucial in understanding the implications of the findings. By interpreting the results in the context of the research questions, researchers can draw meaningful conclusions that contribute to the existing knowledge in the field.

Research design serves as a systematic framework for conducting research, guiding researchers through each stage of the research process from defining the problem to concluding. By following a structured approach, researchers can conduct a thorough and meaningful study that addresses the research questions effectively.

The research design or process outlines the researcher's efforts from start to finish. However, no study design is optimal for everyone. Researchers should create a study design tailored to their task. (Binyamin, 2019). Figure 3.1 depicts the flow chart for this research method.

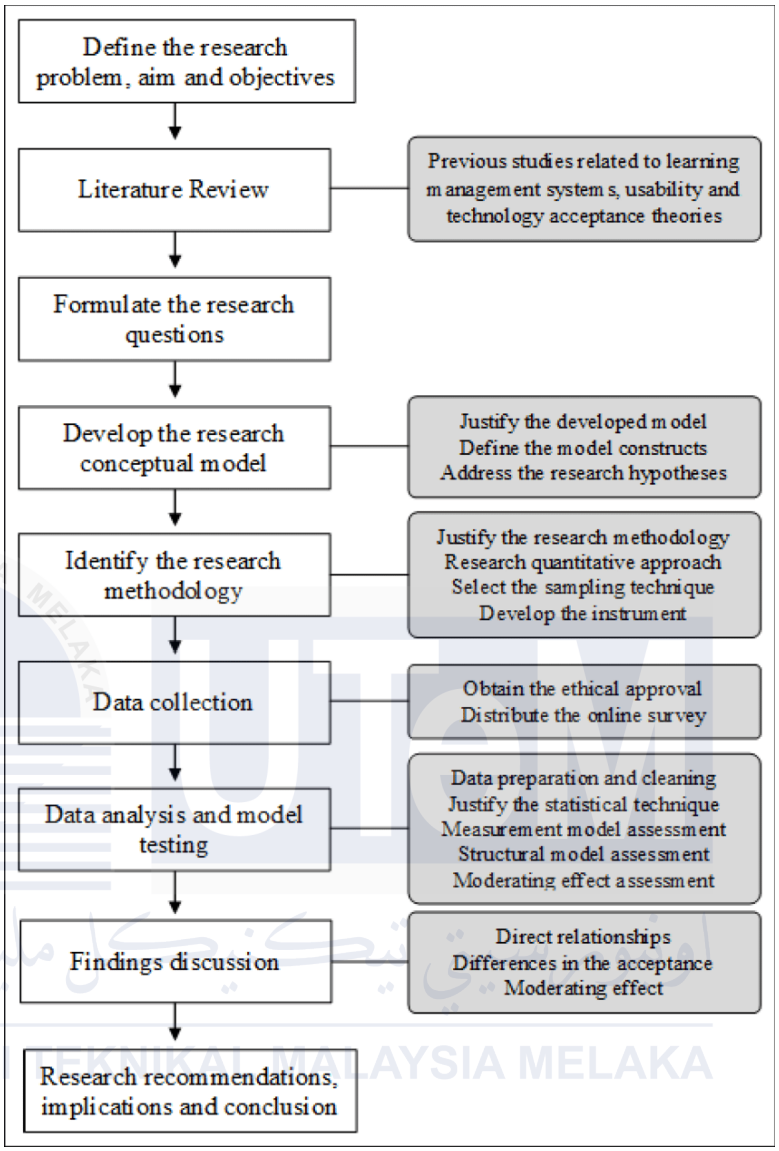

Figure 3.1: Research Design Process

Source: (Binyamin, 2019)

3.3 Research Method

Research methodology is a systematic approach to solving a research challenge. It refers to the study of scientific research methods. This study examines the stages a researcher often takes to analyze a research problem and the reasoning behind it. Researchers need to understand both research methodologies and methodologies. (Nguyen, 2014) In this study, a quantitative research method will be employed to investigate the impact of various features of Google Drive on students' learning outcomes and academic performance. Quantitative research is chosen for its ability to provide numerical data that can be analyzed statistically, allowing for objective conclusions to be drawn from the collected data. (Adams, 2019)

The study found that quantitative research involves quantifying and evaluating variables to obtain results. It entails the use and analysis of numerical data with specialized statistical approaches to answer questions such as who, how much, what, where, when, how many, and how. (Apuke, 2017). Quantitative research is ideal for addressing the research questions posed in this study because it allows for the measurement and analysis of the relationship between variables. By quantifying the usage of different Google Drive features and their impact on student learning outcomes, we can establish clear patterns and associations, providing valuable insights into the effectiveness of Google Drive in facilitating student learning.

A deductive approach will be employed in this study, starting with a theory or hypothesis about the relationship between Google Drive features and student learning outcomes. Deductive reasoning is used to apply different ideas to specific scenarios. (Mukorera, 2016). This approach involves testing the hypothesis through data collection and analysis to either confirm or refute the initial theory. By systematically testing specific hypotheses derived from existing theories or literature, this approach enables us to draw conclusions that are grounded in empirical evidence.

The research will utilize a single quantitative method, namely surveys to collect data from the participants. Surveys will be distributed to students to gather information about their usage of different Google Drive features, perceptions of their impact on learning outcomes, and academic performance. This mono-quantitative

method ensures consistency in data collection and analysis, facilitating a focused examination of the research questions. (Melnikovas, 2018).

By employing a quantitative approach, deductive reasoning, and a mono-quantitative method, this study aims to provide a comprehensive understanding of the role of Google Drive features in student learning outcomes and academic performance. The data collected through surveys will be subjected to statistical analysis to identify correlations among different features of Google Drive and their impact on student learning.

3.4 Location of Research

This study aims to investigate the impact of Google Drive features on students' learning outcomes and academic performance at University Technical Malaysia Melaka (UTeM). UTeM was chosen as the location for a variety of reasons. The research activities will be conducted at the UTeM campus in Melaka, Malaysia. The campus provides a suitable environment for researching educational technology and student learning outcomes. The subject matter chosen for this study focuses on various aspects of student learning facilitated by Google Drive features. It aligns with the curriculum and educational objectives of UTeM, making the research relevant and beneficial to the institution. The decision to conduct the research at UTeM was also influenced by the absence of prior studies specifically addressing the impact of Google Drive features on student learning outcomes within the university context. By focusing on UTeM, this study aims to fill this research gap and contribute valuable insights to the field of educational technology and pedagogy. Additionally, UTeM serves as a central hub for education in Melaka, making it an ideal location to conduct research that can potentially influence educational practices and policies in the region. The findings of this study may serve as a reference point for other educational institutions in Malaysia and beyond, thus enhancing the broader impact of the research.

3.5 Research Strategy

A research strategy is defined as a "general plan of how the researcher will go about answering the research question(s)". They identify many research methodologies for doing exploratory, descriptive, and explanatory research. These include experimentation, surveys, case studies, action research, grounded theory, ethnography, and archival research. The relevance of selecting a research strategy lies in its ability to deliver the study's objectives, thereby answering the research questions fundamental to the investigation. (Mtisi, 2022).

3.5.1 Survey Method for Data Collection

For this quantitative research study, the primary method of data collection will be the survey method. Surveys will be distributed to undergraduate students at UTeM to gather data on their usage of various features of Google Drive, perceptions of their impact on learning outcomes, and academic performance. Many researchers employ the survey approach because it is low-cost, easily used, and can reach a large number of people in a short amount of time. (Salih Gürbüz, 2017).

3.5.2 Questionnaire Development

The questionnaire will consist of items designed to assess students' usage patterns of Google Drive features, their perceived impact on learning outcomes, and academic performance. Questions will be structured using Likert scales to measure the extent of agreement or disagreement with statements related to Google Drive features and their effectiveness in facilitating student learning. The Likert scale is a fundamental and extensively used psychometric tool in educational and social science research. (Joshi et al., 2015). The Likert scale used in this questionnaire will be a 5-point scale, with the following options in the Table 3.3:

Table 3.1: Likert Scale

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3.5.3 Population and Sample

The population for this study comprises 11805 undergraduate students enrolled at the University Technical Malaysia Melaka (UTeM). To determine an appropriate sample size that ensures the representation and statistical significance of the findings, the Krejcie and Morgan table will be employed. Table 3.2 Krejcie and Morgan Table is a well-established guideline for selecting sample sizes based on population size and the desired level of confidence. According to the table, for a population of approximately 11805, a sample size of 370 is considered sufficient to achieve reliable and valid results.

Table 3.2: Krejcie and Morgan Table

Source: (Rehman, 2021)

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

The survey will specifically target undergraduate students from various faculties and programs at UTeM to achieve a broad and thorough representation of the student population. Collecting demographic information is critical for contextualizing replies and spotting patterns or trends within specific sections of the community. Demographic information will be collected, including age, gender, year of study, faculty, frequency of Google Drive use, and the primary reason for use.

3.5.4 Pilot Testing

Pilot testing is crucial for large-scale surveys to improve questionnaire reliability, validity, and usability, particularly in management, social sciences, and education studies. (Wadood et al, 2021). Pilot studies are frequently used as the first stage of experimental research. It is normally on a smaller scale, and the findings can help with intervention creation, research feasibility, and how the study will be implemented if a bigger main study is conducted. This provides a first view of treatment experience, as well as safety and efficacy profiles of therapies or interventions to inform future investigations. (Tseng & Sim, 2021).

Before distributing the survey to the entire sample, a pilot test will be conducted using an initial sample of undergraduate students. This pilot test will serve as a test to evaluate the clarity, relevance, and effectiveness of the questionnaire. Feedback from the pilot test will be used to refine the questionnaire and ensure its validity and reliability before administering it to the full sample. To test the effect of the intervention in a pilot trial, a confidence interval technique is proposed. A sample size of 12 per group was suggested for pilot research based on practicality, mean and variance precision, and regulatory considerations. We considered calculating the sample size of the pilot study to identify any difficulties that arose throughout the investigation. (Tseng and Sim, 2021). In this research, a total of 10 to 14 people will be taken to answer the pilot test before being distributed to other students.

3.6 Time Horizon

A cross-sectional study methodology will be used in this research on "The Features of Google Drive for Effective Students' Learning Purposes." A cross-sectional study collects data at a single point in time to provide an overview of the relationship between variables of interest. A cross-sectional study is a research design in which data is collected from a large number of people at one time. Cross-sectional research involves observing variables without altering them. (Thomas, 2023).

The data collection process for this project will be carried out for approximately 12 months during which time surveys will be delivered to students to acquire information on their use of Google Drive features, perceptions of their impact on learning outcomes, and academic performance. Unlike longitudinal studies, which follow participants over time, cross-sectional studies provide a snapshot of the studied variables at a given time. This method enables the efficient collection of data from a big sample in a relatively short timeframe.

This study will use a cross-sectional design to provide insights into the impact of Google Drive features on students' learning effectiveness, correlations between different features, and the identification of dominant features that contribute significantly to improving student learning outcomes.

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3.7 Data Analysis

Data analysis is a process of using facts and numbers to address research problems. It is critical to determine the answers to the research questions. Data interpretation is a crucial aspect of research, drawing conclusions and judgments based on analysis. When raw data is difficult to deduce, analysis is necessary to determine the results. (Ashirwadam, 2014).

3.7.1 Validity

Validity refers to whether the measuring instrument measures the behavior or quality that it is intended to assess, and it is a measure of how well the measuring instrument functions. Validity is defined as the relevant and appropriate interpretation of data produced from the measuring instrument as a result of the analysis. Validity is defined as obtaining data that is appropriate for the measuring instrument's intended application. In this situation, validity tests are used to determine whether the expressions in the scale provide appropriate metrics for the objective of the research. (Heale & Twycross, 2015).

3.7.2 Reliability

According to Heale and Twycross (2015), reliability refers to the stability and consistency of the measurement instrument throughout time. In other words, reliability refers to the ability to measure tools to produce consistent results when used at different times. Of course, the same results will not be obtained every time because of differences in the time the measuring instrument is used, as well as changes in the population and sample. However, a significant positive correlation between the measuring instrument's data indicates reliability. The reliability of the measuring device is critical for the study's results to be valid. As a result, researchers must guarantee that the measurement tool they utilize is dependable.

Cronbach's alpha will be used to determine the reliability of the measuring devices in this investigation. Cronbach's alpha is a statistic frequently used by writers to illustrate that tests and scales designed or accepted for research projects are fit for purpose. It assesses the relationship between a series of items designed to measure a single latent component. (Taber, 2017). For this study, the Google Drive features under consideration will be divided into multiple constructs, and the dependability of each construct will be assessed separately.

Table 3.3: Cronbach’s Alpha

Source: (Nurul Fadly Habidin et al., 2015)

Cronbach’s Alpha	**Reliability Coefficient**
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Table 3.3 shows Cronbach's Alpha Table. Cronbach's alpha will be determined for each construct associated with Google Drive's features using survey data obtained. This statistic runs from 0 to 1, with higher values suggesting better internal consistency among the components inside each construct. A Cronbach's alpha value of 0.70 or greater is generally deemed acceptable, indicating good internal consistency. Values between 0.60 and 0.70 may be considered acceptable in exploratory research, although they indicate that more modification of the survey items may be required. Values less than 0.60 indicate poor internal consistency, implying that the items do not consistently measure the same construct and need significant adjustment.

Cronbach's alpha results will guide future activities. If the alpha value of any construct falls below the acceptable level of 0.70, the survey items for that construct will be thoroughly evaluated and updated. This revision process may include rephrasing unclear items, eliminating things that do not connect well with others, or introducing new items to better describe the construct at hand. The goal is to obtain high levels of reliability across all constructs, ensuring that the survey is a reliable instrument for assessing the influence of Google Drive features on students' learning effectiveness.

3.7.3 Correlation

In this study, Pearson's correlation coefficient will be used to investigate the correlations between various Google Drive features and their impact on students' learning outcomes and academic achievement. Pearson's correlation coefficient (r) assesses the degree and direction of a linear relationship between two variables, providing useful information about how these characteristics interact and influence learning efficacy. The correlation coefficient (r or R) measures the proximity of two variables. Regardless of non-linear correlation, this work focuses on linear correlation analysis. (Senthilnathan, 2019).

Pearson's r will be calculated for each pair of variables to determine their relationship. The formula for Pearson's r is shown in Table 3.4:

$$r = \frac{\sum(x_{i-}\bar{x})(y_{i-}\bar{y})}{\sqrt{\sum(x_{i-}\bar{x})^2\sum(y_{i-}\bar{y})^2}}$$

Interpretation of Correlation Coefficients:

- The value of Pearson's r ranges from -1 to 1.
    - A value of 1 indicates a perfect positive linear relationship.
    - A value of -1 indicates a perfect negative linear relationship.
    - A value of 0 indicates no linear relationship.

Table 3.4: Formula for Pearson's correlation coefficient

Source: (Tech, 2023)

$\boldsymbol{r}$	Correlation coefficient
$\boldsymbol{x_i}$	Values of the x-variable in a sample
$\boldsymbol{\bar{x}}$	Mean of the values of the x-variable
$\boldsymbol{y_i}$	Values of the y-variable in a sample
$\boldsymbol{\bar{y}}$	Mean of the values of the y-variable

Table 3.5: The Scale of Pearson's correlation coefficient

Source: (Zamani et al., 2020)

The scale of Correlation Coefficient	**Value**
$0 < r \leq 0.19$	Very Low
$0.2 \leq r \leq 0.39$	Low Correlation
$0.4 \leq r \leq 0.59$	Moderate Correlation
$0.6 \leq r \leq 0.79$	High Correlation
$0.8 \leq r \leq 1.0$	Very High Correlation

Table 3.5 shows values between 0.1 and 0.3 (or -0.1 and -0.3) indicate a weak correlation; values between 0.3 and 0.5 (or -0.3 and -0.5) suggest a moderate correlation; and values above 0.5 (or below -0.5) indicate a strong correlation. The results will be provided in a correlation matrix, including Pearson's r values for each pair of variables, as well as scatter plots for visual representation. This thorough investigation will reveal which Google Drive features most effectively improve student learning.

3.7.4 Linear Regression Analysis

Linear regression is a statistical process that calculates the value of a dependent variable from an independent variable. (Kumari & Yadav, 2018). In this study, linear regression analysis will be used to determine the impact of various Google Drive features on students' learning effectiveness. Linear regression is a statistical technique for modeling the relationship between a dependent variable and one or more independent variables, allowing us to quantify the contribution of each component.

The dependent variable in this analysis is student learning effectiveness, which will be measured using composite ratings derived from survey replies. The independent variables are Google Drive's features.

The general form of the linear regression equation used will be:

$$Y=\beta 0+\beta 1X1+\beta 2X2+\ldots+\beta nXn+\epsilon Y=\beta 0+\beta 1X1+\beta 2X2+\ldots+\beta nXn+\epsilon$$

where YY represents the dependent variable (students' learning effectiveness), $X1,X2,\ldots,XnX1,X2,\ldots,Xn$ represent the independent variables (features of Google Drive), $\beta 0\beta 0$ is the intercept, $\beta 1,\beta 2,\ldots,\beta n\beta 1,\beta 2,\ldots,\beta n$ are the coefficients, and $\epsilon\epsilon$ is the error term.

3.7.4.1 R-squared (R^2)

R-squared (R^2) measures how much variance in the dependent variable can be explained by the independent variables. (Vásquez, 2020). A high R^2 number shows that Google Drive's features account for a significant percentage of the diversity in students' learning effectiveness whereas a low R^2 value implies little explanatory power. This metric will assist in determining the overall effectiveness of the regression model. The R-squared (R^2) value will be determined to see how well Google Drive's features explain the variation in students' learning effectiveness. A model with an R^2 value close to 1 has significant explanatory power.

3.7.4.2 F-value

The F-value tests the model's overall significance by determining if the dependent variable has a meaningful link with the set of independent variables. (Vásquez, 2020). A high F-value with a low p-value (usually < 0.05) suggests that the model is statistically significant, implying that at least one of the Google Drive features has a meaningful impact on students' learning effectiveness. The F-value will be used to assess the overall significance of the regression model. A significant F-value indicates that the model fits the data well, implying that the overall features of Google Drive have a considerable impact on learning effectiveness.

3.7.4.3 t-value

The t-value for each independent variable determines if a given Google Drive feature significantly helps to predict students' learning effectiveness. A high absolute t-value (> 2) and low p-value (< 0.05) indicate that the characteristic is a significant predictor of the dependent variable. The t-values for each independent variable will be compared to see which specific Google Drive features are significant predictors of student learning effectiveness. Features with substantial t-values will be regarded as crucial for improving learning effectiveness. (Jahan & Khan, 2012).

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The results of the data analysis collected from 171 respondents will be focused on the study named The Features of Google Drive for Effective Students' Learning Purposes. The analysis will begin with a pilot test, then descriptive statistics, correlation analysis, and regression analysis. Data for this study were acquired by questionnaires sent to students at Universiti Teknikal Malaysia Melaka (UTeM) using an online Google Survey Form. The collected data will be analyzed using the Statistical Package for Social Science (SPSS) version 27 and provided in table format.

4.2 Result of Descriptive Analysis

In this research, descriptive statistics was used by the researcher to analyze the demographic background for a total of 171 respondents. In this section, the background of respondents is analyzed including gender, race, year of study, faculty, type of devices used for academic purposes, and frequency of using Google Drive for academic purposes.

4.2.1 Gender

Table 4.1: Gender of Respondents

(Sources: SPSS Output)

Gender			
		Frequency	Percent (%)
Valid	Male	77	45.0
	Female	94	55.0
	Total	171	100.0

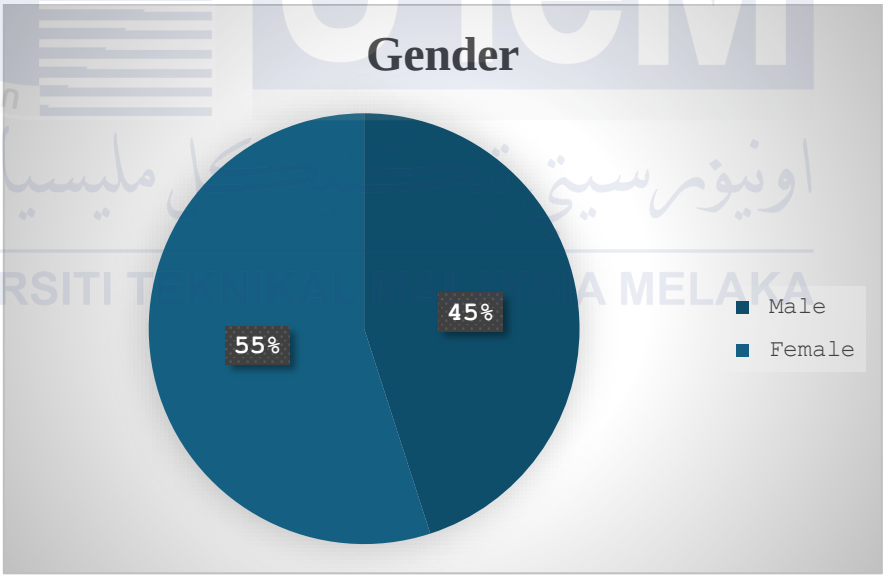

Figure 4.1 Gender of Respondents

Table 4.1 and Figure 4.1 shows that the gender of all 171 respondents who were answering the questionnaires. It shows that the total for male were 77 respondents which were 45% from the total, while the total for female was 94 respondents which were 55% from the total. The total of female employee was more that male employee.

4.2.2 Race

Table 4.2: Race of Respondents

(Sources: SPSS Output)

Race			
		Frequency	Percent (%)
Valid	Malay	109	63.7
	Chinese	33	19.3
	India	22	12.9
	Other	7	4.1
	Total	171	100.0

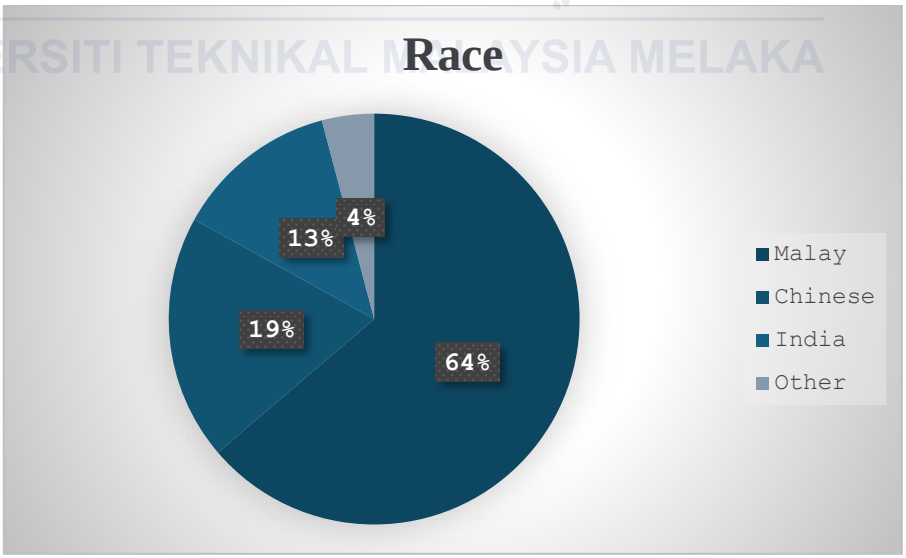

Figure 4.2: Race of the Respondents

The racial distribution of the 171 respondents who took part in the survey is displayed in Table 4.2 and Figure 4.2. The majority of respondents (109, or 63.7% of the total) are Malay, followed by 33 Chinese respondents (19.3%), 22 Indian respondents (12.9%), and 7 respondents from other races (4.1%). The largest group of respondents is Malay, representing 63.7% of the total, followed by Chinese respondents (19.3%) and Indian respondents (12.9%). The smallest group is made up of respondents from other races, comprising only 4.1% of the total respondents.

4.2.3 Year of Study

Table 4.3: Year of Study of Respondents

(Sources: SPSS Output)

Year of Study			
		Frequency	Percent (%)
Valid	Year 1	27	15.8
	Year 2	44	25.7
	Year 3	34	19.9
	Year 4	66	38.6
	Total	171	100.0

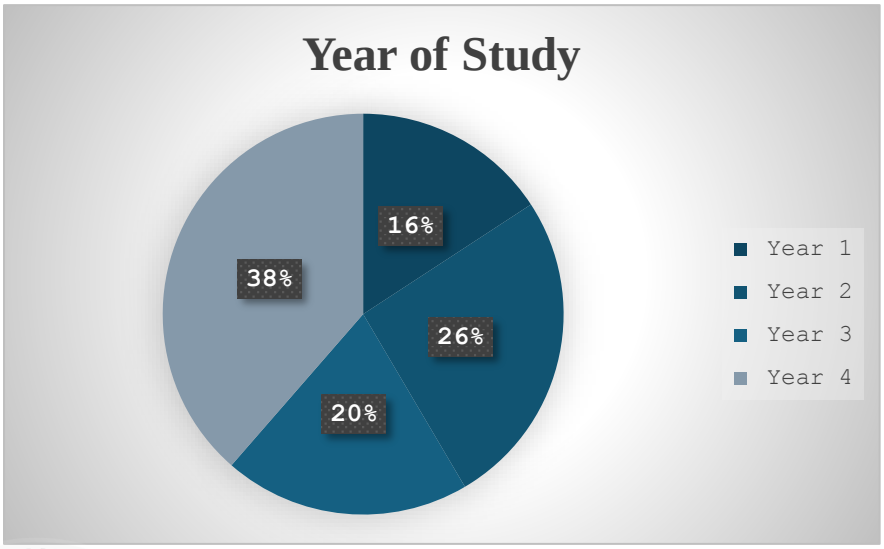

Figure 4.3: Year of the Study

Table 4.3 and Figure 4.3 illustrates the distribution of respondents based on their year of study. The majority of respondents are from Year 4, with a total of 66 respondents, making approximately 38.6% of the total. Next in line, representing 25.7%, are 44 responders from Year 2. 34 respondents, or 19.9% of the total, are from Year 3, and the smallest group, comprising 27 respondents, or 15.8% of the total, is from Year 1. The largest group of responders is from Year 4, representing 38.6%, followed by Year 2 at 25.7%, Year 3 at 19.9%, and Year 1 at 15.8%.\

4.2.4 Faculty

Table 4.4: Faculty

(Sources: SPSS Output)

Faculty			
		Frequency	Percent (%)
Valid	Faculty of Electronics and Computer Technology and Engineering (FKEKK)	18	10.5
	Faculty of Electrical Technology and Engineering (FKE)	36	21.1
	Faculty of Mechanical Technology and Engineering (FKM)	28	16.4
	Faculty of Industrial and Manufacturing Technology and Engineering (FTKIP)	17	9.9
	Faculty of Information and Communications Technology (FTMK)	17	9.9
	Faculty of Technology Management and Technopreneurship (FPTT)	55	32.2
	Total	171	100.0

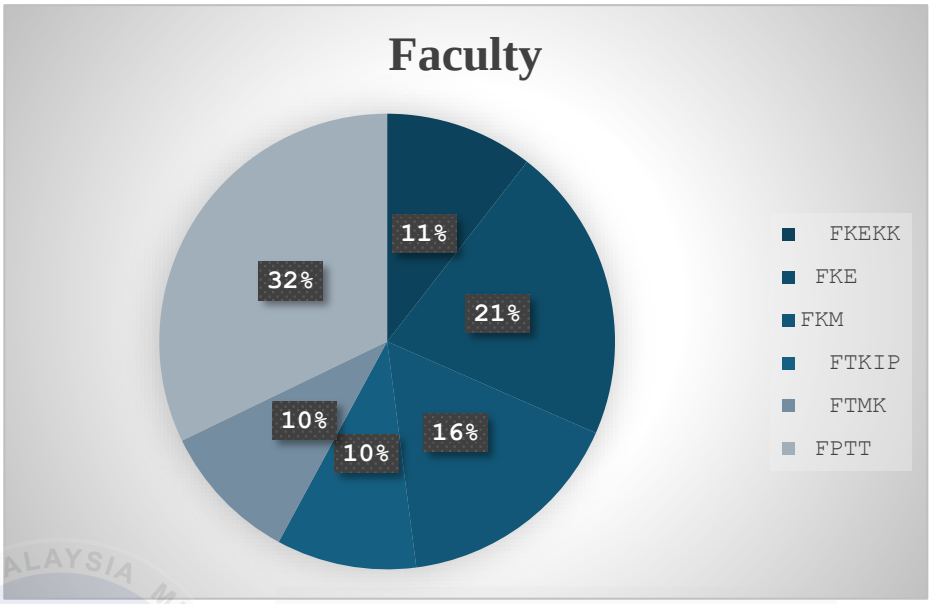

Figure 4.4: Faculty

Table 4.4 and Figure 4.4 displays the distribution of respondents according to their faculty. The Faculty of Technology Management and Technopreneurship accounts for the majority of respondents, 55 in total, or 32.2%. This is followed by the Faculty of Electrical Technology and Engineering, with 36 replies, or 21.1%. The Faculty of Mechanical Technology and Engineering has 28 responses and contributes 16.4%. The Faculty of Industrial and Manufacturing Technology and Engineering and the Faculty of Information and Communication Technology each have 17 responders, accounting for 9.9% of the total. Finally, the Faculty of Electronics, Computer Technology, and Engineering has 18 responders, representing 10.5%.

4.2.5 Residential Status

Table 4.5: Residential Status

(Sources: SPSS Output)

Residential Status			
		Frequency	Percent (%)
Valid	On-Campus	80	46.8
	Off-Campus	91	53.2
	Total	171	100.0

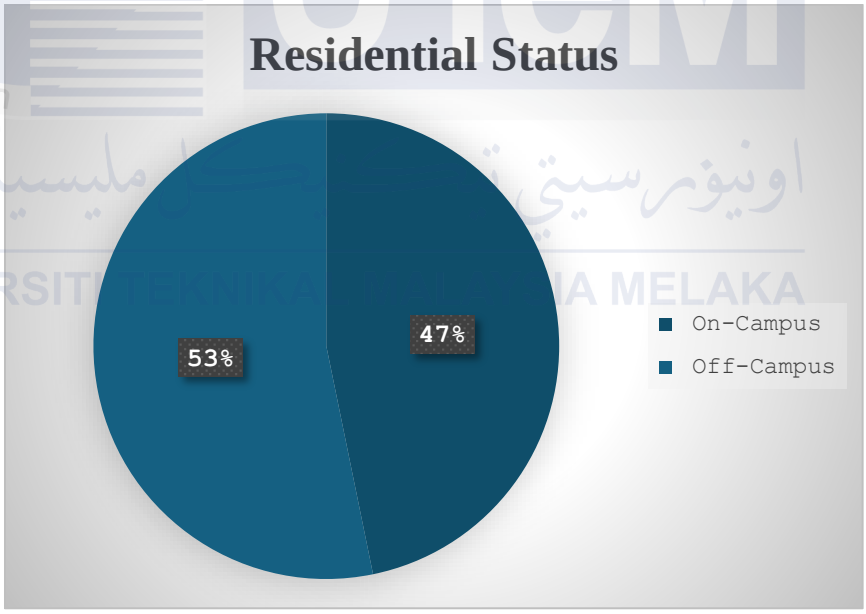

Figure 4.5: Residential Status of Respondents

Table 4.5 and Figure 4.5 illustrates the distribution of respondents based on their residential status. The majority of responders (91 in total) reside off-campus, accounting for 53.2%. Meanwhile, 80 respondents live on campus, accounting for 46.8% of the total. The majority of respondents (53.2%) live off-campus, followed by those who live on-campus (46.8%).

4.2.6 Access to Internet

Table 4.6: Access to Internet

(Sources: SPSS Output)

Access to Internet			
		Frequency	Percent (%)
Valid	Yes	171	100.0

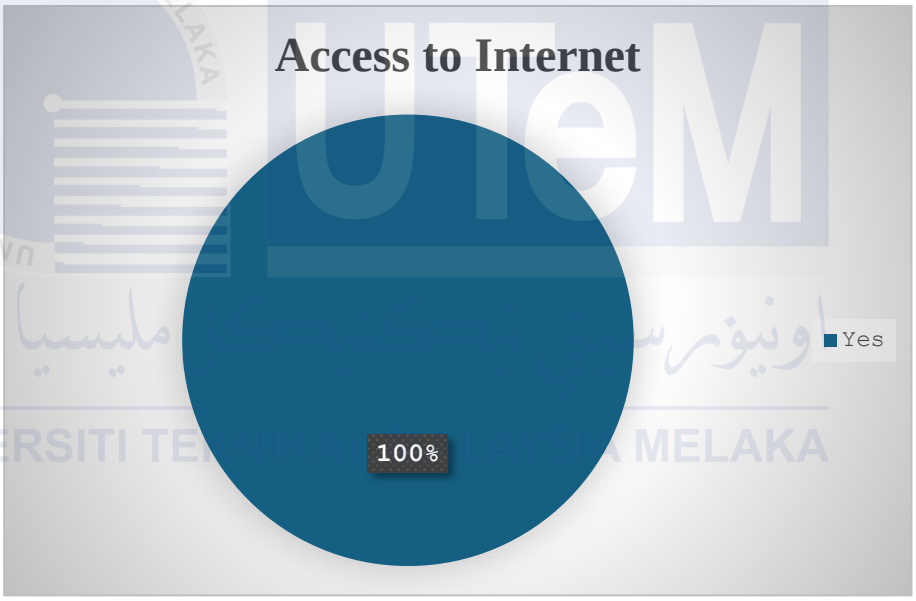

Figure 4.6: Access to the Internet

Table 4.6 and Figure 4.6 illustrates the distribution of respondents according to their internet access. All 171 respondents (100.0% of the total) reported having internet access. This shows that every respondent in the study has an internet connection, making it a resource available to all participants.

4.2.7 Type of Devices Used for Academic Purpose

Table 4.7: Type of Devices Used for Academic Purpose

(Sources: SPSS Output)

Type of Devices Used for Academic Purpose			
		Frequency	Percent (%)
Valid	Laptop/PC	23	13.5
	Laptop/PC, Tablet	56	32.7
	Laptop/PC, Tablet, Smartphone	76	44.4
	Tablet	16	9.4
	Total	171	100.0

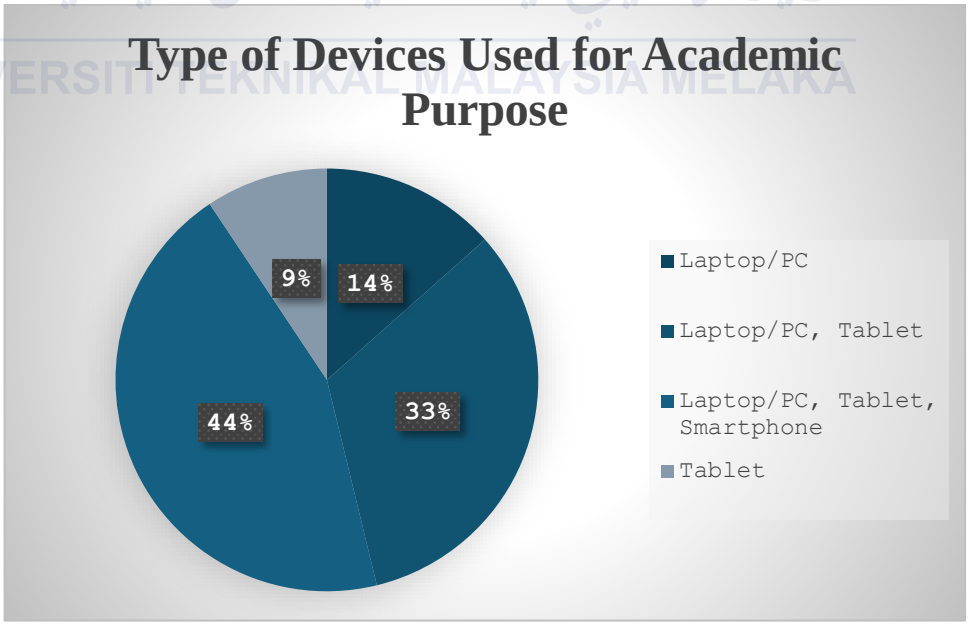

Figure 4.7: Type of Devices Used for Academic Purpose

Table 4.7 and Figure 4.7 illustrates the distribution of respondents according to the devices they use for learning. The majority of respondents (76) utilize a mix of laptop/PC, tablet, and smartphones, accounting for 44.4% of the total. This is followed by 56 respondents who use both laptop/PC and tablet, accounting for 32.7%. A smaller group of 23 respondents, or 13.5%, rely entirely on a laptop/PC, while 16 respondents utilize only a tablet, accounting for 9.4% of the total. The most popular combination of devices is Laptop/PC, Tablet, and Smartphone (44.4%), followed by Laptop/PC and Tablet (32.7%), with fewer respondents using only a Laptop/PC (13.5%) or a Tablet (9.4%).

4.2.8 Frequency of Using Google Drive for Academic Purposes

Table 4.8: Frequency of Using Google Drive for Academic Purposes

(Sources: SPSS Output)

Frequency of Using Google Drive for Academic Purposes			
		Frequency	Percent (%)
Valid	Daily	50	29.2
	Weekly	63	36.8
	Monthly	32	18.7
	Rarely	26	15.2
	Total	171	100.0

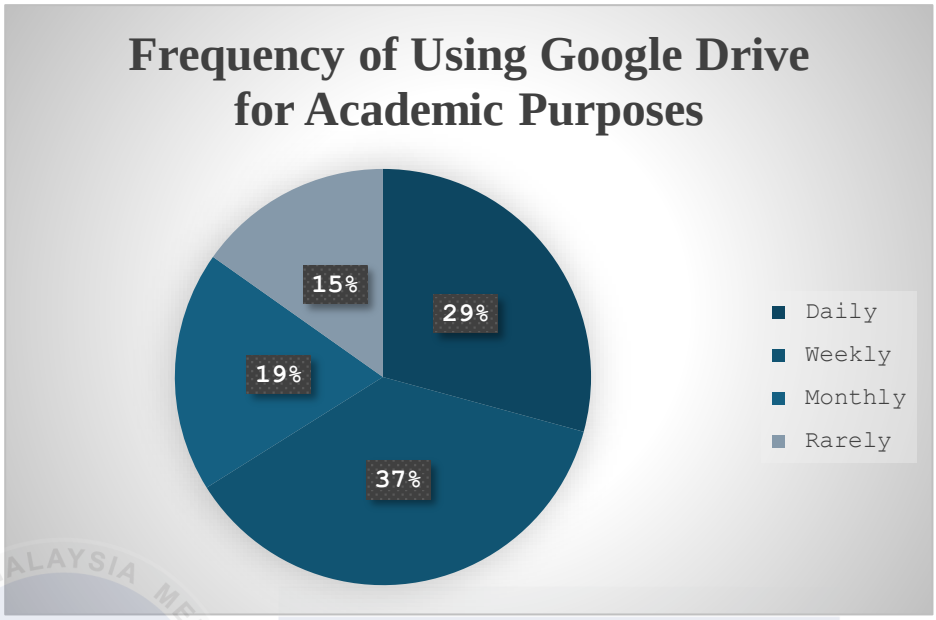

Figure 4.8: Frequency of Using Google Drive for Academic Purposes

Table 4.8 and Figure 4.8 depicts the distribution of respondents based on their frequency of usage. The largest group consists of 63 responders who use the service weekly, accounting for 36.8% of the total. This is followed by 50 responders who use it every day, accounting for 29.2%. A smaller group of 32 respondents reported using it monthly, accounting for 18.7%, while 26 respondents said they rarely used it, accounting for 15.2% of the total. The most common usage pattern is weekly (36.8%), followed by every day (29.2%). Monthly usage is 18.7%, with rare usage (15.2%) being the least prevalent.

4.3 Result of Data Analysis

4.3.1 Normality Test: Skewness and Kurtosis

In statistics, skewness and kurtosis are two approaches to assessing the form of a distribution. Skewness measures a distribution's asymmetry. This value may be positive or negative. Negative skew shows that the tail is on the left side of the distribution and extends to greater negative values. Positive skew implies that the tail is on the right side of the distribution, extending to higher positive values. A value of 0 shows that the distribution has no skewness, which means it is symmetrical. Kurtosis is a measure of a distribution's heavy or light tails in comparison to a normal distribution. Normal distributions have a kurtosis of 3. If a distribution has a kurtosis less than 3, it is considered playkurtic, which indicates it produces fewer and less extreme outliers than the normal distribution. If a distribution's kurtosis is more than 3, it is considered leptokurtic, which means it produces more outliers than the normal distribution. (Bobbitt, 2022)

Table 4.9: Normality Test: Skewness and Kurtosis

(Sources: SPSS Output)

	Skewness		**Kurtosis**	
	Statistic	**Std. Error**	**Statistic**	**Std. Error**
Allows real-time communication.	-1.109	.186	.591	.369
Enables quick feedback.	-1.032	.186	.443	.369
Grants access to documents from any device.	-1.363	.186	1.252	.369
Able to track document updates.	-1.106	.186	.465	.369
Easily retrieved by individuals.	-1.062	.186	.306	.369
Permits access by a group.	-1.015	.186	.253	.369

Provides link for public view.	-1.136	.186	.540	.369
Offers read-only function.	-.956	.186	.074	.369
Enable documents editing.	-1.162	.186	.666	.369
Requires a Google account.	-1.157	.186	.607	.369
Provides security when transferring data	-.917	.186	.202	.369
Automatically protect stored data.	-.926	.186	-.029	.369
Safeguards user privacy.	-.975	.186	.193	.369
Should restrict file downloading.	-.997	.186	.119	.369
Should restrict file copying.	-1.015	.186	.338	.369
Aligns (updates) file changes across devices.	-1.040	.186	.423	.369
Automatically back-up files to prevent data loss.	-1.090	.186	.415	.369
Provides expandable storage space.	-1.111	.186	.648	.369
Supports a range of file types.	-.928	.186	-.037	.369
Let user retrieve the files from any device.	-1.102	.186	.734	.369
Ensures the files are secured	-.937	.186	.161	.369
Protects the files from unauthorized use.	-1.044	.186	.128	.369
Increases active participation.	-1.101	.186	.567	.369
Creates interest in learning activities.	-.932	.186	.107	.369
Helps them retain information longer.	-1.142	.186	.539	.369
Improves utilization of resources.	-1.036	.186	.739	.369
Enhances group learning and discussion.	-1.122	.186	.313	.369
Boosts their confidence.	-.851	.186	.355	.369
Suitable for acquiring technical skills.	-1.239	.186	.763	.369

Skewness and kurtosis are important measures to understand the shape of a dataset's distribution. Skewness assesses the symmetry of the data, and negative skewness means the distribution stretches more toward the left with larger values, while positive skewness shows the opposite with smaller values. According to Hair et al. (2022), skewness between -1 and +1 is excellent, while values between -2 and +2 are generally acceptable. Skewness values for this dataset range from -0.

Kurtosis determines whether a distribution is peaked or flat in comparison to normal. Positive kurtosis implies a stronger peak (leptokurtic), whereas negative kurtosis indicates a flatter distribution (platykurtic). Values from -2 to +2 are acceptable. In this study, kurtosis scores range from -0.037 to 1.252, indicating that the data is platykurtic, with fewer extreme values. This shows that the dataset is stable and unaffected by significant outliers. (Hair, 2022)

Overall, the skewness and kurtosis values are within acceptable ranges, implying that the data is sufficiently normal for further statistical investigation. This makes it appropriate for procedures like regression and correlation while ensuring consistent results.

4.3.2 Reliability Test

4.3.2.1 Pilot Test

Before beginning the process of distributing questionnaires to a large population, a pilot test is undertaken with a small number of respondents to validate the research topic. Pilot studies were often designed to test, on a small scale, the processes indicated in a previously prepared research plan, and then based on the results of the pilot, adjustments would be made to the plan. (Fraser et al., 2018).

For the pilot test, 12 sets of questionnaires are prepared by the researcher to get feedback from the respondents. (Tseng and Sim, 2021). The researcher used the SPSS version 27 to check the reliability of the data collected, and Cronbach’s Alpha method was applied to measure the reliability. According to Zamani et al. (2020), a Cronbach's Alpha score of 0.7 or higher is deemed appropriate. Good values are those that are greater than 0.8, while excellent values are those that are 0.9 and

higher. In contrast, Cronbach's Alpha is considered questionable if it falls between 0.6 and 0.7, poor if it falls between 0.5 and 0.6, and unacceptable if it falls below 0.5.

Table 4.10: Reliability Statistics for All Items

(Sources:SPSS Output)

Case Processing Summary			
		N	%
Cases	Valid	12	100.0
	Excluded[a]	0	.0
	Total	12	100.0
a. Listwise deletion based on all variables in the procedure.			

Variables	Cronbach's Alpha	N of Items
Students' collaboration (IV1)	0.906	4
Sharing Files (IV2)	0.882	6
Data Encryption (IV3)	0.654	5
Synchronizing (IV4)	0.745	2
File Stored (IV5)	0.940	5
Student Learning Effectiveness (DV)	0.882	7

Table 4.10 shows the reliability (Cronbach's Alpha) of various constructs. Students' collaboration (α = 0.906) and File Stored (α = 0.940) exhibit excellent reliability, indicating strong internal consistency. Sharing Files (α = 0.882) and Student Learning Effectiveness (α = 0.882) also show good reliability. However, Data Encryption (α = 0.654) has a lower alpha, suggesting that its items may need revision to improve consistency. Synchronizing (α = 0.745), with only two items, shows moderate reliability, which could be enhanced by adding more items for a more stable measurement.

4.3.3 Correlation Test

Table 4.11: Correlations

(Sources: SPSS Output)

Correlations							
		IV1	**IV2**	**IV3**	**IV4**	**IV5**	**DV**
IV1	**Pearson Correlation**	1	.947**	.871**	.877**	.895**	.927**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	171	171	171	171	171	171
IV2	**Pearson Correlation**	.947**	1	.915**	.897**	.901**	.952**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	171	171	171	171	171	171
IV3	**Pearson Correlation**	.871**	.915**	1	.853**	.908**	.911**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	171	171	171	171	171	171
IV4	**Pearson Correlation**	.877**	.897**	.853**	1	.866**	.878**
	Sig. (2-tailed)	.000	.000	.000		.000	.000

	N	171	171	171	171	171	171
IV5	**Pearson Correlation**	.895**	.901**	.908**	.866**	1	.911**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	171	171	171	171	171	171
DV	**Pearson Correlation**	.927**	.952**	.911**	.878**	.911**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	171	171	171	171	171	171
****. Correlation is significant at the 0.01 level (2-tailed).**							

Table 4.11 shows five independent variables, IV (Students' Collaboration), IV2 (Sharing files), IV3 (Data Encryption), IV4 (Synchronizing), and IV5 (File Stored) were analyzed using Pearson correlation analysis.

The results showed The independent variables (IV1, IV2, IV3, IV4, and IV5) show very strong positive relationships across all pairings. Using the scale of correlation coefficients, where $0.8 \leq r \leq 1.0$ indicates a very high correlation, it is clear that all variables are closely related to one another.

The strongest relationship is between IV1 and IV2, with a correlation of r=0.947. This suggests that these two variables are closely linked and share a significant amount of variance. IV1 also has very high correlations with IV3 (r=0.871), IV4 (r=0.877), and IV5 (r=0.895). Among these, the relationship between IV1 and IV5 is slightly stronger than its relationships with IV3 and IV4.

IV2 also shows very strong correlations with the other variables. It has a particularly high correlation with IV3 (r=0.915), indicating a strong association. The relationships between IV2 and IV4 (r=0.897) and between IV2 and IV5 (r=0.901) are also very strong, although slightly weaker than the one between IV2 and IV3.

When looking at IV3, its relationship with IV4 (r=0.853) is the weakest among all pairings. However, this is still classified as a very high correlation. IV3 and IV5 (r=0.908) share a stronger relationship compared to IV3 and IV4. Lastly, IV4 and IV5 (r=0.866) also show a very high correlation, although not as strong as other pairings involving IV5.

Overall, all correlations between the independent variables are very closely related. The strongest association is between IV1 and IV2, followed by IV2 and IV3. These findings highlight a significant level of overlap among the variables, suggesting they are all strongly connected.

4.3.4 Regression Test

4.3.4.1 Multiple Regression Analysis (Model Summary)

Table 4.12: Multiple Regression Analysis (Model Summary)

(Sources: SPSS Output)

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.963[a]	.927	.924	.28086

The model summary result, which illustrates the relationship between the independent variables and the dependent variable, is shown in Table 4.12. The correlation coefficient (R) was 0.963, indicating a very strong relationship between the dependent variable (student learning effectiveness using Google Drive) and the independent variables (student collaboration, file sharing, data encryption, synchronization, and File Stored in Google Drive).

The value of the coefficient of determination (R Square) was 0.927, meaning that 92.7% of the variation in student learning effectiveness is explained by the five independent variables. This suggests that the independent variables have a significant

influence on student learning effectiveness. The remaining 7.3% of the variation in the dependent variable is influenced by other factors that are not included in this research.

4.3.4.2 Multiple Regression Analysis (ANOVA)

Table 4.13: Multiple Regression Analysis (ANOVA)

(Sources: SPSS Output)

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	164.235	5	32.847	416.397	.000[b]
	Residual	13.016	165	.079		
	Total	177.251	170			

Table 4.13 displays the results of the ANOVA, where the F-test value was 416.397 with a significance level of p = 0.000 (p < 0.05). The high F-test value of 416.397 indicates that the overall regression model is a good fit for the data, suggesting a significant relationship between the independent variables (students' collaboration, sharing files, data encryption, synchronization, and File Stored in Google Drive) and the dependent variable (student learning effectiveness using Google Drive). We can rule out the null hypothesis because the p-value is below the significance level of 0.05. This indicates that when students use Google Drive for learning, the independent factors have a significant impact.

4.3.4.3 Multiple Regression Analysis (Coefficients)

Table 4.14: Multiple Regression Analysis (Coefficients)

(Sources: SPSS Output)

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.114	.088		1.290	.199		
	IV1	.156	.069	.157	2.250	.026	.091	10.968
	IV2	.478	.081	.491	5.874	.000	.064	15.699
	IV3	.144	.058	.148	2.462	.015	.123	8.109
	IV4	.023	.048	.024	.467	.641	.175	5.710
	IV5	.168	.058	.173	2.905	.004	.125	7.984

The results of the multiple regression analysis, as shown in Table 4.14, reveal the impact of each independent variable (IV) on student learning effectiveness.

Students' Collaboration (IV1) has a Beta of 0.156, with a significant value of 0.026, indicating a moderately positive effect on learning effectiveness. Sharing Files (IV2) has the highest Beta value of 0.478, with a significant value of 0.000, suggesting it has the strongest and most significant impact on students' learning.

Data Encryption (IV3) shows a moderate positive effect with a Beta of 0.144 and a significant value of 0.015. File Stored in Google Drive (IV5) has a Beta of 0.168, with a significant value of 0.004, also indicating a positive contribution to learning effectiveness. However, Synchronizing (IV4) has a Beta of 0.023, with a non-significant value of 0.641, meaning it does not significantly influence learning effectiveness.

In summary, Sharing Files (IV2) has the greatest impact, followed by Students' Collaboration (IV1) and File Stored (IV5), while Synchronizing (IV4) does not contribute significantly.

The linear regression equation based on these findings is:

Y= 0.157X1+0.491X2 +0.148X3 +0.024X4 +0.173X5

Where:

- Y = Student Learning Effectiveness
- X1 = Students Collaboration
- X2 = Sharing Files
- X3 = Data Encryption
- X4 = Synchronizing
- X5 = File Stored

This model shows that Sharing Files (X2) has the most significant influence on student learning effectiveness

4.4 Result Discussion

Using SPSS software version 27, the researcher examined the gathered data in this chapter, displaying the findings in tables and figures. To determine the relationship between the independent variable's student collaboration, file sharing, data encryption, synchronization, and File Stored and the dependent variable, student learning effectiveness, descriptive statistics, correlation analysis, ANOVA, and regression analysis were performed. Google Drive file sharing had the most effect on student learning effectiveness, according to the analysis, which also showed strong and significant connections between the variables. These results successfully meet the study's goals and shed light on how Google Drive's features can improve students' educational experiences.

4.4.1 Descriptive Analysis

The descriptive analysis summarizes the demographic and contextual characteristics of the 171 respondents in this study. Gender distribution shows a slightly higher proportion of female respondents (55%) than males (45%), indicating a balanced but female-majority sample. In terms of racial distribution, Malay respondents make up the majority (63.7%), followed by Chinese (19.3%), Indians (12.9%), and other races (4.1%), demonstrating diversified involvement but with a strong Malay presence. In terms of year of study, the majority of respondents are in Year 4 (38.6%), followed by Year 2 (25.7%), Year 3 (19.9%), and Year 1 (15.8%), indicating that the sample was made up of older students. Faculty representation shows that the Faculty of Technology Management and Technopreneurship contributes the most (32.2%), followed by other engineering and technology faculties, reflecting respondents' academic focus. Furthermore, 53.2% of respondents live off-campus, with 46.8% living on-campus, indicating a nearly equal split in residential status. Notably, all respondents reported having internet access, demonstrating that connectivity is a shared resource among participants. The gadgets utilized for learning varied, with the majority (44.4%) combining a laptop/PC, tablet, and smartphone, while some preferred specific devices or combinations. Google Drive's usage frequency found that weekly use was most popular (36.8%), followed by daily use (29.2%), showing that it is regularly used for academic reasons. This

detailed demographic profile ensures a broad yet representative sample, serving as a solid foundation for the study's following studies.

4.4.2 Reliability Analysis

Table 4.15: Reliability Analysis

(Sources: SPSS Output)

Variables	Cronbach's Alpha	N of Items
Students' collaboration	0.949	4
Sharing Files	0.946	6
Data Encryption	0.953	5
Synchronizing	0.883	2
File Stored	0.965	5
Student Learning Effectiveness	0.968	7

The reliability analysis results in Table 4.15 show the internal consistency of the survey instruments, assessed using Cronbach's Alpha. Based on standard reliability benchmarks, a Cronbach's Alpha value of $\alpha \geq 0.9$ alpha is considered excellent, and all variables in this study meet or exceed this standard, demonstrating outstanding reliability. The variable Students' Collaboration has a Cronbach's Alpha of 0.949, indicating excellent reliability across its four items. Similarly, Sharing Files has a value of 0.946 for six items, while Data Data Encryption achieves a slightly higher score of 0.953 for five items, both reflecting strong internal consistency. Synchronizing, with an Alpha of 0.883 for two items, falls within the good reliability category but still demonstrates a strong level of consistency and File Stored stands out with the highest score of 0.965 across five items, showing exceptional reliability. Additionally, the dependent variable, Student Learning Effectiveness, also achieved an excellent reliability score of 0.968 for seven items. (Nurul Fadly Habidin et al., 2015). Overall, these results confirm that the survey items are highly reliable and consistent in measuring their respective constructs, providing a solid foundation for further analysis.

4.4.3 Correlation Analysis

The correlation analysis reveals that the independent variables IV1 (Students' Collaboration), IV2 (Sharing Files), IV3 (Data Encryption), IV4 (Synchronizing), and IV5 (File Stored) are all very closely related. Most of the correlations are very high, indicating strong positive relationships between these variables. The strongest correlation was found between IV1 (Students' Collaboration) and IV2 (Sharing Files) with a very high value of r=0.947. This suggests that students who collaborate more are also more likely to share files. IV1 also showed strong correlations with IV3 (Data Encryption), IV4 (Synchronizing), and IV5 (File Stored), with values ranging from r=0.871r = 0.871 to r=0.895. This shows that as collaboration increases, students are also more likely to engage in activities like encrypting, synchronizing, and storing files. IV2 (Sharing Files) similarly showed strong correlations with IV3, IV4, and IV5, especially with IV3 (Data Encryption) at r=0.915. This suggests that students who share files are also concerned with file security and organization. One interesting finding was the slightly weaker correlation between IV3 (Data Encryption) and IV4 (Synchronizing), with a correlation of r=0.853. Although still very high, this indicates that encryption and synchronization, while related, may not always go hand in hand. Finally, IV4 (Synchronizing) and IV5 (File Stored) showed a strong positive correlation of r=0.866, indicating that students who synchronize their files are also likely to store them properly, though the connection isn't as strong as with other variables. In conclusion, the results show that these students' collaboration, sharing files, encryption, synchronization, and file storage are all strongly connected.

4.4.4 Regression Analysis

The results from the model summary, shown in Table 4.12, demonstrate a very strong connection between the dependent variable student learning effectiveness using Google Drive and the independent variables, which include students' collaboration, file sharing, data encryption, synchronization, and File Stored. The correlation coefficient (R) was found to be 0.963, indicating a very strong positive relationship between the independent variables and student learning effectiveness. Additionally, the coefficient of determination (R Square) was 0.927, suggesting that 92.7% of the variation in student learning effectiveness can be explained by the five

independent variables. This highlights the substantial impact of these factors on student learning, with the remaining 7.3% potentially influenced by other factors not covered in this study.

The ANOVA results, presented in Table 4.13, further support the significance of the regression model. The F-test value was 416.397, with a p-value of 0.000 ($p < 0.05$). This high F-value indicates that the regression model fits the data well, confirming the existence of a strong and statistically significant relationship between the independent variables and the dependent variable. The p-value, being lower than the threshold of 0.05, suggests that the null hypothesis can be rejected. This means that the students' collaboration, file sharing, data encryption, synchronization, and File Stored have a significant and meaningful effect on student learning effectiveness when using Google Drive.

The coefficients from the regression analysis are summarized in Table 4.14. The findings reveal that students' collaboration (IV1) had a beta value of 0.157 with a significance level of 0.026, indicating a positive and significant impact on student learning effectiveness. File sharing (IV2) showed the highest beta value of 0.491, with a significance of 0.000, indicating that it has the greatest influence on student learning. Data Encryption (IV3) exhibited a moderate impact, with a beta value of 0.148 and a significance level of 0.015. Synchronization (IV4) had a beta value of 0.024 and a significance of 0.641, suggesting that it does not significantly affect student learning. File Stored (IV5) was found to have a moderate positive effect, with a beta value of 0.173 and a significance level of 0.004.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter expands on the data analysis results reported in Chapter 4 and provides a complete interpretation of the findings. The researcher analyzes the study's findings concerning the research objectives, highlighting crucial insights gleaned from the data. Furthermore, this chapter discusses the ramifications of the findings, and the constraints observed during the study and makes recommendations for future research. This chapter hopes to close the gap between the findings and their practical and theoretical implications by addressing these issues.

5.2 Research Objective Achievement

The research objectives were stated as below:

1. To investigate the extent to which the features of Google Drive impact students' learning effectiveness.
2. To analyze the correlations among different features of Google Drive to understand their interrelationships.
3. To determine the dominant feature of Google Drive that significantly contributes to enhancing student learning effectiveness.

Research Objective 1: To investigate the extent to which the features of Google Drive impact students' learning effectiveness.

This study aimed to understand how Google Drive features, such as collaboration, file sharing, data encryption, synchronization, and file storage, affect students' learning. The results show that these features together explain 92.7% (R Square = 0.927) of student learning effectiveness changes. This means that the model is highly effective in predicting how these features influence learning. Even when adjusted for the number of predictors, the adjusted R Square value remains high at 0.924, showing that the model is reliable. The ANOVA test also confirms the significance of the model, with an F-value of 416.397 and a p-value of 0.000. This proves that the impact of Google Drive features on learning is not due to chance but is statistically significant. These findings highlight that features of Google Drive play a major role in helping students collaborate, retain information, and learn effectively. The results confirm that the research objective has been successfully achieved.

Research Objective 2: To analyze the correlations among different features of Google Drive to understand their interrelationships.

The second objective aimed to explore the relationships between the features of Google Drive Students' Collaboration (IV1), Sharing Files (IV2), Data Encryption (IV3), Synchronizing (IV4), and File Stored (IV5)—using Pearson correlation coefficients. The analysis revealed strong interrelationships among the features. IV1 and IV2 showed a very high positive correlation ($r = 0.947$, $p < 0.01$), indicating that collaborating students are also more likely to engage in file sharing. Similarly, IV1 and IV3 were highly correlated ($r = 0.871$, $p < 0.01$), as were IV1 and IV4 ($r = 0.877$, $p < 0.01$) and IV1 and IV5 ($r = 0.895$, $p < 0.01$). The strongest correlation was observed between IV2 and IV5 ($r = 0.901$, $p < 0.01$), suggesting that sharing files is closely linked to the ability to store them effectively. Other notable relationships include the high correlation between IV3 and IV5 ($r = 0.908$, $p < 0.01$) and the strong interdependence of features like IV4 and IV5 ($r = 0.866$, $p < 0.01$). These findings show that Google Drive's features are strongly interconnected, with some features, like sharing files and storing them, showing particularly close relationships. This highlights the integrated nature of these tools in supporting student learning.

Research Objective 3: To determine the dominant feature of Google Drive that significantly contributes to enhancing student learning effectiveness.

The third objective of the study aimed to identify which specific Google Drive feature has the most significant impact on students' learning effectiveness. To achieve this, the analysis utilized the unstandardized Beta coefficients from the multiple regression model. The results indicated that Sharing Files (IV2) emerged as the dominant feature with the highest unstandardized Beta value of 0.478, suggesting that it has the strongest effect on student learning effectiveness among all the features studied. This feature is followed by File Stored (IV5), with a Beta of 0.168, and Students' Collaboration (IV1), with a Beta of 0.156. These features significantly influence student learning, as indicated by their relatively high Beta values and low significance levels. In contrast, Data Encryption (IV3) and Synchronizing (IV4) have lower Beta values (0.144 and 0.023, respectively), with Synchronizing (IV4) not being statistically significant ($p = 0.641$). This suggests that, while these features contribute to the learning environment, they are less impactful compared to others like Sharing Files and Students' Collaboration. Thus, Sharing Files (IV2) stands out as the most significant feature of Google Drive in terms of enhancing students' learning effectiveness

5.3 Research Hypothesis Achievement

Table 5.1: Summary of Hypothesis Testing

Hypothesis	t- value	Sig. Value	Result
H1: There is a significant relationship between students collaboration (IV1) and student learning effectiveness (DV).	2.250	0.026 < 0.05	H1 is accepted.
H2: There is a significant relationship between Sharing Files (IV2) and student learning effectiveness (DV).	5.874	0.000 < 0.05	H2 is accepted.
H3: There is a significant relationship between Data Encryption (IV3) and student learning effectiveness (DV).	2.462	0.015 < 0.05	H3 is accepted.
H4: There is a significant relationship between Synchronizing (IV4) and student learning effectiveness (DV).	.467	0.641 > 0.05	H4 is rejected.
H5: There is a significant relationship between File Stored (IV5) and student learning effectiveness (DV).	2.905	0.004 < 0.05	H5 is accepted.

Hypothesis 1 (H1): There is a significant relationship between students' collaboration using Google Drive and their learning effectiveness.

The results show that students' collaboration has a significant impact on their learning effectiveness, with a t-value of 2.250 and a p-value of 0.026, which is less than 0.05. This means the relationship is strong and meaningful. The Pearson correlation for collaboration is 0.927, showing a strong positive link between these two factors. In terms of demographics, the study included 45% male and 55% female students, and students from different years of study (Year 1: 15.8%, Year 2: 25.7%,

Year 3: 19.9%, Year 4: 38.6%). As students progress in their studies, their ability to collaborate using tools like Google Drive improves, which in turn boosts their learning. (Gupta et al., 2022). This result matches previous research that found that collaborative learning helps students learn more effectively (Stanley, 2021). Therefore, H1 is accepted, meaning that collaboration using Google Drive does have a significant impact on student learning.

Hypothesis 2 (H2): There is a significant relationship between sharing files using Google Drive and students' learning effectiveness.

The findings also support this hypothesis, with a t-value of 5.874 and a p-value of 0.000, which is well below 0.05. This shows a strong and significant link between file sharing and learning effectiveness, with a Pearson correlation of 0.952, indicating a very strong positive relationship. Many students (44.4%) use different devices like computers, tablets, and smartphones, which makes sharing files easy and frequent. This likely contributes to improved learning. (Lee, Jahnke, & Austin, 2021). Previous studies have shown that sharing resources can improve learning outcomes, especially in group settings (Tang, Lau, & Chau, 2022). Thus, H2 is accepted, confirming that sharing files on Google Drive significantly improves student learning effectiveness.

Hypothesis 3 (H3): There is a significant relationship between data encryption in Google Drive and students' learning effectiveness.

The analysis found a significant relationship between data encryption and learning effectiveness, with a t-value of 2.462 and a p-value of 0.015, which is below 0.05. The Pearson correlation for encryption is 0.911, indicating a strong positive link. This shows that data security is important for improving learning, as students feel safer and more engaged when their data is protected. In the study, students from fields like Electronics and Computer Technology (10.5%) and Information and Communications Technology (9.9%) may be more aware of the importance of encryption. (Gupta et al., 2022). Research has shown that a secure learning environment helps students feel more confident and focused (Zhang & Liu, 2023).

Therefore, H3 is accepted, confirming that data encryption plays a key role in improving learning effectiveness.

Hypothesis 4 (H4): There is a significant relationship between synchronizing files in Google Drive and students' learning effectiveness.

The results show that synchronizing files does not significantly impact learning effectiveness, with a t-value of 0.467 and a p-value of 0.641, which is greater than 0.05. Even though the Pearson correlation is 0.878, indicating some positive relationship, the lack of statistical significance means synchronization doesn't directly affect how well students learn. This may be due to students' years of study and device usage. For example, Year 4 students (38.6%) may be more familiar with synchronization, but it doesn't always lead to better learning outcomes. (Pecora & Caroll, 2015). Previous research also suggests that synchronization, though useful for data consistency, doesn't have a big impact on learning results (McShane et al., 2023). Therefore, H4 is rejected, meaning synchronization doesn't have a significant effect on student learning.

Hypothesis 5 (H5): There is a significant relationship between storing files in Google Drive and students' learning effectiveness.

The analysis confirms that file storage is significantly related to learning effectiveness, with a t-value of 2.905 and a p-value of 0.004, which is below the 0.05 threshold. The Pearson correlation for file storage is 0.911, showing a strong positive link. Many students (44.4%) use multiple devices (laptop, tablet, smartphone) for their studies, and easy access to stored files across devices likely helps them learn better. According to studies, having easy access to resources via cloud storage is crucial for boosting learning outcomes. (Yeun & Johar, 2022). Research supports the idea that cloud storage improves learning by making resources more accessible (Lakizo et al., 2019). Therefore, H5 is accepted, confirming that storing files in Google Drive significantly enhances student learning.

In summary, the study found that H1, H2, H3, and H5 are accepted, meaning that students' collaboration, file sharing, data encryption, and file storage all significantly improve student learning effectiveness. However, H4 is rejected because synchronization doesn't have a significant effect on learning.

5.4 Significant Contribution (Implication) of the Study

The study's conclusions make significant contributions to three major areas: the body of knowledge, industry implementation, and national policy. These results highlight the importance of Google Drive features in improving student learning outcomes and provide useful insights for theoretical advancements, practical applications, and policy development.

5.4.1 Body of Knowledge

This study contributes to the current literature on the use of cloud-based tools in education by identifying specific Google Drive features Students Collaboration, sharing, encryption, Synchronizing, and File Stored that influence student learning effectiveness. The findings show that various elements have varying degrees of impact on learning outcomes, with collaboration, sharing, and File Stored ranking as the most significant (Kang, Yang, & Zheng, 2022). These findings are consistent with previous research which highlights the relevance of collaborative and sharing features in promoting active learning.

Furthermore, the study contributes to the understanding of how privacy measures like Data Encryption provide a secure learning environment, as previously described (How, 2023). By bridging the gap between cloud technology and education, this research helps to construct theoretical models that incorporate technological tools into educational frameworks.

5.4.2 Industry

The findings have practical consequences for the education technology sector and educational institutions. The importance of student collaboration and sharing functionalities suggests that makers of cloud-based applications should prioritize improving these aspects to optimize their utility in educational settings. Google, for example, might improve its Drive platform to provide more fluid collaborative interfaces and easy sharing choices suited specifically for academic use.

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5.4.3 Nation

At a national level, the findings can inform education strategies aiming at incorporating technology into the curriculum. Governments should encourage the adoption of cloud-based applications like Google Drive as part of digital literacy campaigns. This is consistent with national education goals that aim to prepare students for a technologically advanced world, as stressed in frameworks such as UNESCO's guidelines for technology integration in education (Tondeur et al., 2019). Policies that support fair access to cloud tools, particularly for impoverished populations, can help to close the digital divide and guarantee that new technologies benefit everyone.

Furthermore, the role of Data Encryption in student learning emphasizes the necessity for strong data privacy legislation that protects student information when using online platforms. Legislators can use these findings to strengthen rules such as the General Data Protection Regulation (GDPR) or other frameworks that ensure the safe use of educational technology.

5.5 Limitations of the Study

While this study gives useful insights into the function of Google Drive features in improving student learning effectiveness, it has limitations. These constraints on the research's scope may have had an impact on the findings' comprehensiveness and generalizability.

One noticeable limitation was the sample population's demographic homogeneity. Most participants were students from similar educational institutions, which may not accurately reflect the wide variety of learners that use Google Drive worldwide. For example, differences in access to technology, cultural attitudes toward collaboration, or educational environments may influence how Google Drive is used. To overcome this, future research could broaden the sample to include students from other nations, educational levels, and socioeconomic backgrounds. A more diverse sample would provide a more comprehensive picture of how Google Drive's features influence learning in various circumstances.

The study relied mainly on self-reported survey data, which could be biased due to social desirability or faulty self-assessment. Participants may have overstated or underestimated their use of Google Drive features or the influence on learning effectiveness. Future research that incorporates observational or experimental methodologies may help to mitigate these biases. For example, analyzing actual Google Drive usage patterns using analytics or doing controlled tests may provide more objective data and validate the conclusions.

While the study focused on five key features Students Collaboration, sharing, encryption, Synchronizing, and File Stored it is possible that other characteristics that potentially influence student learning were neglected. Integration with other apps, real-time editing capabilities, and complex organizational features may all be important considerations. Future research might take a broader approach, exploring other features or comparing Google Drive to other cloud-based applications to uncover distinct and overlapping benefits.

The study was conducted over a short period of time, making it difficult to detect the long-term effects of Google Drive use on learning efficacy. For example, while team cooperation and sharing had an immediate impact, the study did not look into how these aspects lead to long-term academic improvement. Longitudinal

studies would solve this issue by examining the association between Google Drive usage and learning outcomes over an extended time period.

Although quantitative data provided useful statistical insights, a lack of qualitative data hampered our comprehension of students' experiences and perceptions. Future studies should include interviews or focus groups to collect people' varied viewpoints. This would provide a more comprehensive understanding of how and why various features improve learning outcomes.

To attain better results, future research should aim for a more diverse and representative sample, employ mixed method approaches that combine qualitative and quantitative data, and broaden the scope to include new features and technologies. Employing longitudinal designs and including objective measurements such as usage analytics may improve the reliability and application of findings. By overcoming these constraints, future research can expand on the current study's findings to provide more detailed and generalizable insights into the function of cloud-based tools in education.

5.6 Recommendation and Future Direction

This study demonstrated the importance of Google Drive capabilities in improving student learning effectiveness, providing valuable insights into their use in academic settings. However, there are other areas where future studies might build on these discoveries to broaden the knowledge base and close gaps. The recommendations below detail future intentions for this study issue as well as potential paths for exploration.

Future studies might look into other popular cloud-based technologies like Microsoft Teams, OneDrive, and Dropbox to guarantee that this research continues. A comparison investigation of various platforms could reveal their relative usefulness in increasing cooperation, productivity, and learning outcomes. Furthermore, with the growing integration of artificial intelligence (AI) into digital tools, it is critical to investigate how AI-powered features in platforms such as Google Drive can tailor learning experiences. AI-generated file-organizing

suggestions and automatic collaborative feedback have the potential to greatly improve usability and productivity (Luan et al., 2023; Manyika, 2011).

Another topic worth investigating is the long-term consequences of Google Drive use. While this study focused on the immediate benefits, further research using a longitudinal method could indicate how persistent use affects academic performance and collaborative behavior over time. Researchers could uncover patterns and trends in students' interaction with Google Drive features and examine the long-term impact by tracking them throughout successive semesters (Firdaus et al., 2023; Li et al., 2019).

It is also necessary to broaden the scope of the features being investigated. While this study focused on five key Google Drive capabilities, other functionality, such as interaction with Google Workspace applications (e.g., Google Docs, Sheets, Slides) and third-party add-ons, might be studied. For example, researching how real-time collaboration in Google Docs affects group projects or how Google Forms supports active learning may bring fresh insights into how to best use these tools in educational settings (Hsu et al., 2021).

Future studies should look into non-academic applications of Google Drive. Its efficacy in workplace cooperation, project management, and personal productivity may provide a larger view of its utility. For example, investigating its impact in facilitating team cooperation in distant work contexts may emphasize its importance in professional settings, especially with the development of telecommuting and hybrid work patterns (Mohammadi et al., 2022).

Moreover, to ensure inclusivity and representativeness, future research should include individuals from a variety of educational levels, ethnic backgrounds, and socioeconomic circumstances. This diversity would aid in determining whether the efficiency of Google Drive features differs depending on access to technology, digital literacy, or cultural variables. Such research could provide targeted recommendations for various user groups, especially those in resource-constrained environments, to improve their capacity to effectively use these tools (Xu et al., 2021).

Finally, incorporating upcoming technologies like virtual reality (VR) and augmented reality (AR) into Google Drive could create new opportunities for learning and collaboration. For example, allowing the sharing and interaction of 3D

models, AR simulations, or VR-based learning modules via Google Drive could transform hands-on learning experiences, particularly in sectors such as medical, engineering, and design (Huang et al., 2023).

In conclusion, the continuation of this research can be secured by looking at new digital tools, doing longitudinal studies, and including varied populations. Exploring future innovations and non-academic applications of Google Drive capabilities will help us comprehend the broader impact. These efforts will ensure that digital tools such as Google Drive continue to be crucial for learning and collaboration in an increasingly digitalized society.

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APPENDIX A

GANTT CHART FYP 1

Task/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Confirm and ensure that the topic meets the faculty's requirements															
Submit a topic proposal form															
Topic correction															
Send the topic proposal form to the supervisor															
Chapter 1 lecture and writing															
Chapter 2 lecture and writing															
Submit the topic verification form															
Chapter 3 lecture and writing															
Submit PSM Chapter 1 and 2 reports															
Chapter 1, 2, and 3 submission															
Prepare presentation slides															
Finished checking the report															
Slide correction															
Send softcopy and video to the supervisor															
Discussion on presentation preparation															
Presentation of FYP 1															

APPENDIX B

GANTT CHART FYP 2

Task/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Confirm survey questionnaires															
Collect data															
Discuss 4 and 5															
Attend SPSS training															
Write Chapter 4															
Write Chapter 5															
Submit the full draft of Chapters 1 to 5															
Standby for Viva presentation															

APPENDIX C

SURVEY QUESTIONNAIRES

A perfect day to everyone, my name is Qatrunnadia Binti Sahak. I am an undergraduate student in the Bachelor Degree of Technology Management (Innovation Technology) at Universiti Teknikal Malaysia Melaka (UTeM). I am currently conducting my research paper about "The Features of Google Drive for Effective Students' Learning Purpose."

This study aims to investigate how the features of Google Drive can enhance students' learning experiences. Therefore, I would like to invite you to spend about 5 to 10 minutes to fill out this survey form. This questionnaire is divided into three parts: Part A asks about respondents' demographic profiles, Part B explores the features of Google Drive used by students, and Part C examines the effectiveness of these features in supporting learning.

Your participation is voluntary, and your information will be kept confidential and used solely for research purposes. Thank you very much for your cooperation.

If there are any questions regarding this questionnaire, please do not hesitate to contact me at

Part A: Demographic Profile

1. Gender

- Male
- Female

2. Race

- Malay
- Chinese
- India
- Others

3. Year of Study

- Year 1
- Year 2
- Year 3
- Year 4

4. Faculty

- Faculty of Electronics and Computer Technology and Engineering
- Faculty of Electrical Technology and Engineering
- Faculty of Mechanical Technology and Engineering
- Faculty of Industrial and Manufacturing Technology and Engineering
- Faculty of Information and Communications Technology
- Faculty of Technology Management and Technopreneurship

5. Mode of the Study

- Full-time
- Part-time

6. Residential Status

- On-campus
- Off-campus

7. Access to Internet

- Yes
- No

8. Type of Device(s) Used for Academic Purposes

- Laptop/PC
- Tablet
- Smartphone
- Other (Please specify)

9. Frequency of Using Google Drive for Academic Purposes

- Daily
- Weekly
- Monthly
- Rarely

Part B: Features Of Google Drive

This part talks about the Features of Google Drive. Please rate from 1-5 (1-Strongly Disagree, 2-Disagree, 3-Somewhat Agree, 4-Agree, 5-Strongly Agree).

Students Collaboration using Google Drive						
		1	2	3	4	5
1	Allows real-time communication.					
2	Enables quick feedback.					
3	Grants access to documents from any device.					
4	Able to track document updates.					

Sharing Files using Google Drive						
		1	2	3	4	5
1	Easily retrieved by individuals.					
2	Permits access by a group.					
3	Provides link for public view.					
4	Offers read-only function.					
5	Enable documents editing.					
6	Requires a Google account.					

Data encryption (secret code) in Google Drive						
		1	2	3	4	5
1	Provides security when transferring data					
2	Automatically protect stored data.					
3	Safeguards user privacy.					
4	Should restrict file downloading.					
5	Should restrict file copying.					

Synchronizing in Google Drive						
		1	2	3	4	5
1	Aligns (updates) file changes across devices.					
2	Automatically back-up files to prevent data loss.					

File Stored in Google Drive						
		1	2	3	4	5
1	Provides expandable storage space.					
2	Supports a range of file types.					
3	Let user retrieve the files from any device.					
4	Ensures the files are secured					
5	Protects the files from unauthorized use.					

Part C: Student Learning Effectiveness

This part talks about Student Learning Effectiveness. Please rate from 1-5 (1-Strongly Disagree, 2-Disagree, 3-Somewhat Agree, 4-Agree, 5-Strongly Agree).

Student Learning Effectiveness Using Google Drive						
		1	2	3	4	5
1	Increases active participation.					
2	Creates interest in learning activities.					
3	Helps them retain information longer.					
4	Improves utilization of resources.					
5	Enhances group learning and discussion.					
6	Boosts their confidence.					
7	Suitable for acquiring technical skills.					

End of Questions