



**MANAGEMENT OF WEB-BASED LEARNING SYSTEM AT THE DURBAN
UNIVERSITY OF TECHNOLOGY**

By

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ABSTRACT

Effectively managing Learning Management Systems (LMS) in web-based learning is pivotal for the overall success of online education initiatives. A well-administered LMS enhances student engagement, improves learning experiences, and ensures technical reliability. Conversely, inadequate management can lead to issues such as low engagement, technical glitches, and insufficient progress tracking. Critical elements of LMS management include establishing a coherent course structure, integrating multimedia content, monitoring student progress, and maintaining a robust technical foundation. Therefore, creating a well-structured course design is essential, involving the definition of course objectives, content, activities, and assessments. The design should be user-friendly, promoting easy navigation and logical progression through materials. Incorporating multimedia resources, such as videos and audio, can enhance content engagement and accessibility, particularly for students facing challenges with written text.

Managing student progress is equally crucial and involves tracking activities within the LMS, including participation in discussions, completion of assignments, and assessment performance. This data can offer valuable insights for providing feedback and identifying areas where additional support may be needed. Therefore, the LMS should incorporate robust reporting and analytics features to aid lecturers in tracking and improving student performance. Ensuring a reliable technical infrastructure is fundamental, encompassing secure hosting, efficient servers, and a strong network for uninterrupted student access. Regular maintenance and updates are necessary to address technical glitches and maintain the relevance of the LMS.

This study focused on examining the management of a web-based LMS known as ThinkLearnZone (TLZ) at Durban University of Technology (DUT), utilising a mixed methods approach with a sequential explanatory design. Quantitative data was collected and analysed first, followed by qualitative data to provide deeper insights. A convenience sampling method was used for gathering qualitative data, while a simple random sampling method was employed for quantitative data collection. The

population of the study consisted of 33 000 students and 1 500 lecturers from six faculties. For quantitative data analysis, the Statistical Package for the Social Sciences (SPSS) version 28.0 was employed to analyse the collected data. For qualitative data analysis, thematic content analysis was employed to identify recurring themes and patterns within the data. This comprehensive approach allowed for a thorough examination of TLZ management and its impact on both students and lecturers within the DUT community, providing valuable insights for improving online education initiatives.

The study highlights the crucial role of lecturer assistance and engagement in enhancing student motivation and performance in the online learning environment. Active guidance during web-based sessions fosters an interactive atmosphere and improves learning outcomes. Additionally, facilitating online discussions promotes deeper understanding of course materials. However, the research also reveals significant challenges faced by students and lecturers within the TLZ platform at DUT. These include limited access to technology and inadequate equipment, interruptions from students, lack of support and training, and power outages. Addressing these challenges is vital for ensuring equitable access to education and maximising the effectiveness of online learning initiatives within TLZ at DUT. Thus, this study seeks to develop a framework that provides practical strategies for overcoming the challenges inherent in web-based teaching and learning at DUT.

DECLARATION

I, the undersigned declare that:

MANAGEMENT OF WEB-BASED LEARNING SYSTEM AT THE DURBAN UNIVERSITY OF TECHNOLOGY is my original work, that all sources used or quoted have been acknowledged in the list of references, and that this thesis was not previously submitted for a degree at any institution of higher learning.

Candidate Name: Mbalenhle Khumalo

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Date: 01/03/2024

DEDICATION

I dedicate this work to:

- My beloved late mother, Ntombifuthi Gladys Khumalo. I deeply yearn for your presence, especially now as I strive to fulfil your greatest aspiration. Your unwavering passion for education was truly remarkable and you imparted its importance to everyone you encountered. Even today, I hold dear the memories of your inspiring words. Living my life aligned with your values has been an immense privilege and joy. This achievement, dedicated to you, is a heartfelt tribute. I know you're looking down and smiling.
- To my grandmother, Stutela Agnes Khumalo. Although you have never set foot in a classroom, your sheer dedication to my education surpasses anything I could imagine. Your relentless prayers and tireless efforts have propelled me forward even during the most challenging times. With deep admiration, I can confidently say that you are the most knowledgeable person I have ever known. I vow to continuously strive for excellence in all that I do, ensuring that I never cease to make you proud. This dedication is a testament to your profound influence and an expression of my utmost gratitude. Izandla zidlula ikhanda Mzilikazi kaMashobane.

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Psalm 91: He who dwells in the secret place of the Most High will rest in the shadow of the Almighty. I will say of the LORD, "He is my refuge and my fortress, my God, in whom I trust."

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LIST OF ABBREVIATIONS

ASEM	Auckland Student Engagement Model
CMS	Course Management Systems
COI	Community of Inquiry
D2L	Desire2Learn
DUT	Durban University of Technology
EOU	Ease of Use
E-learning	Electronic Learning
FRC	Faculty Research Committee
HEIs	Higher Education Institutions
HLE	High Level Engagement
ICT	Information Communication Technology
IT	Information technology
IRIC	Institutional Research and Innovation Committee
LMS	Learning Management System
LCMS	Learning Content Management Systems
MIS	Management Information System
NMMU	Nelson Mandela Metropolitan University
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
OCL	Online Collaborative Learning
PLEs	Personalised Learning Environments
REC	Research Ethics Committee
SA	South Africa
SPSS	Statistical Package of Social Sciences
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TLZ	Think Learn Zone
VLE	Virtual Learning Environments
VLS	Virtual Learning Systems

CHAPTER 1: INTRODUCTION AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION

This study presents an examination of the management of activities linked with the web-based LMS at the DUT. The main objective was to understand and conceptualise the management of activities linked with web-based teaching and learning at the selected university.

Web-based LMSs have become increasingly popular in recent years as a means of delivering educational content to students in a more efficient and convenient manner. However, the management of activities linked with these systems can be complex and presents several challenges that require critical examination. One of the primary challenges associated with the management of web-based LMSs is ensuring that the content delivered through the system is up-to-date and relevant. This requires a dedicated effort to regularly update and maintain the course material to ensure that it remains current and accurate.

Another challenge is ensuring that the selected LMS is user-friendly and accessible to all students. This requires careful consideration of the user interface design, as well as the accessibility and functionality of the system. It is essential to ensure that the LMS is intuitive and easy to use, particularly for students who may be less technologically savvy. Furthermore, effective management of the activities linked with web-based LMS also requires attention to the quality of the content delivered through the system. The content must be engaging, interactive, and effective in meeting the learning objectives of the course. This may require collaboration between subject matter experts and instructional designers to develop content that is both effective and engaging.

The management of activities linked with web-based LMS also requires attention to the evaluation of student progress and the effectiveness of the course material. This

includes the use of assessment tools and analytics to track student progress and identify areas for improvement in the course material. Moreover, the management of web-based LMS activities must also consider the security and privacy of student data. This requires the implementation of robust security measures and compliance with data privacy regulations to protect student information and maintain trust in the system. Effective management of these factors is essential for the success of web-based LMS and the delivery of quality education to students.

1.2 BACKGROUND OF THE STUDY

LMSs are software platforms designed to manage and deliver educational courses, training programmes, and other learning activities online (Bradley, 2021). These systems provide a centralised platform for lecturers to create and manage content, track student progress, administer assessments, and communicate with students. LMS platforms can be used in various educational settings, such universities, vocational training institutions, and corporate training programmes (Zabolotniaia et al., 2020).

There are various learning management systems available, including open-source systems such as Moodle and proprietary systems such as Blackboard and Canvas (Salah and Thabet, 2021). These platforms are used by many educational institutions in South Africa, including DUT, to support online and blended learning environments, especially during the COVID-19 pandemic when many schools and universities shifted to online teaching and learning. The management of activities linked with web-based LMS involves the effective coordination and organisation of various aspects of online learning, including course design, content creation, assessment, communication, and learner support (Bradley, 2021). This requires the implementation of sound management practices and the use of appropriate tools and technologies to facilitate effective delivery and management of online courses.

Research on the management of activities linked with web-based LMS has focused on identifying best practices for course design and development, strategies for engaging learners in online environments, and techniques for assessing and evaluating online learning outcomes. Additionally, studies have explored the use of analytics and data-driven decision making to improve online course delivery and the effectiveness of LMS

platforms (Kew and Tasir, 2022). The goal of this research in this area was to improve the quality and effectiveness of online learning through the development of effective management practices and the use of innovative tools and technologies and practical strategies to overcome challenges associated with web-based teaching and learning.

1.3 PROBLEM STATEMENT

The management of activities related to web-based teaching and learning has gained significant importance in recent years due to the increasing use of technology in education (Dhawan, 2020). The growth of online learning, distance learning, and remote work has made it crucial to effectively manage web-based teaching and learning activities to ensure that students receive a high-quality education and successfully achieve their learning objectives. As a result, educational institutions, including DUT, are adopting LMS to facilitate the teaching and learning process, with DUT utilising ThinkLearnZone as their chosen LMS. According to Shishakly, Sharma, and Gheyathaldin (2021), many universities have been upgrading their existing LMS to more advanced systems in recent years. This transition requires students and lecturers to quickly familiarise themselves with the new system, as any changes in the LMS may potentially impact their performance and productivity. It is essential for users to adapt to the functionalities and features of the new LMS to effectively utilise its capabilities in teaching and learning (Kraleva, Sabani, Kralev and Kostadinova, 2020).

A study by Bansah and Darko Agyei (2022) indicates that transitioning from old to new LMSs demands a significant amount of time and impacts users' performance. Despite various advantages offered by LMSs such as flexibility and improved access to learning materials, the administration of activities within these systems presents several challenges for South African universities, including DUT. The effectiveness of web-based teaching and learning, along with the challenges associated with its implementation, raises significant concerns for both students and lecturers (Bilgiç and Tuzun, 2020). Despite the potential benefits of web-based learning platforms, there is a pressing need to thoroughly evaluate their effectiveness and address barriers hindering their optimal utilisation.

Within the context of DUT, access to technology remains a significant hurdle, affecting both students and staff and impeding the organisation and coordination of activities related to teaching and learning in the web-based learning system. Lack of access to technology can restrict students' participation in online classes, limit their access to course materials, and hinder their engagement with interactive learning tools (Abou-Khalil, Helou, Khalifé, Chen, Majumdar and Ogata, 2021). Similarly, limited access to technology may hamper lecturers' ability to provide timely support and feedback to students and effectively utilise digital resources for instructional purposes. Moreover, gaps in communication resulting from technological barriers can lead to misunderstandings, delays in information dissemination, and disruptions in the teaching and learning process (Morrison-Smith and Ruiz, 2020). Addressing issues related to technology access is therefore crucial for optimising the management of activities within the web-based learning environment at DUT.

Furthermore, the identification and mitigation of challenges associated with web-based teaching and learning are imperative for DUT's educational stakeholders. Given these pressing issues, there is a compelling need to develop a framework that offers practical strategies for overcoming the challenges inherent in web-based teaching and learning at DUT. This framework would not only facilitate the effective utilisation of existing resources but also pave the way for continuous improvement and innovation in online education delivery.

1.4 AIM AND OBJECTIVES

The main aim was to understand and conceptualise the management of web-based learning system at the DUT. The study's specific objectives are to:

- To determine the effectiveness of web-based teaching and learning.
- To identify challenges associated with web-based teaching and learning.
- To examine the correlation between academic assistance/engagement and students' performance.

- To develop a framework that can provide practical strategies for overcoming web-based teaching and learning challenges.

The research questions were as follows:

- How effective is web-based teaching and learning?
- What challenges are associated with web-based teaching and learning?
- What is the correlation between academic assistance/engagement and students' performance?
- What framework can be used to provide practical strategies needed to overcome challenges associated with web-based teaching and learning?

1.5 SIGNIFICANCE OF THE STUDY

The aim of this study was to understand and conceptualise the management of activities linked to web-based learning system at the DUT. The study has the potential to improve the effectiveness of online learning by identifying best practices and strategies for managing activities in web-based LMS. This includes ways to engage students, provide feedback, and promote collaboration among learners. Additionally, the study can enhance lecturer training programmes by developing more effective training modules on managing online courses and activities in LMS, which can improve the quality of online education and lecturers' skills in managing online learning environments. The study can also increase student satisfaction with online learning by identifying factors that affect their learning experiences, such as the ease of navigation, accessibility, and responsiveness of the LMS platform. Moreover, the study can provide insights for LMS developers on how to design and develop more user-friendly and effective LMS platforms for managing online learning activities. Lastly, the study adds to the existing knowledge on online education by offering new perspectives on managing web-based LMS activities, leading to further research and development in this field that can ultimately benefit students, lecturers, and institutions.

1.6 RESEARCH DESIGN

A research design is a comprehensive strategy that connects theoretical study problems to practical empirical research. It determines the necessary information, data collection and analysis methods, and how the collected data will be utilised to address the researcher's research questions (Sekaran and Bougie, 2016). In this study, a combined qualitative and quantitative approach was employed. Specifically, an explanatory sequential mixed-methods strategy was utilised, incorporating both a questionnaire (quantitative) and semi-structured interviews (qualitative). Data were gathered from lecturers and students representing six faculties within the selected university. The selection of this research design was based on its potential to address the research questions effectively and overcome any research challenges by generating usable data for analysis, ultimately aiding in resolving the research questions.

1.6.1 Target population

To ensure a comprehensive representation of the entire institution, the study included academic staff and students from DUT across six different faculties. The selection of participants from multiple faculties aimed to capture a diverse range of perspectives and experiences related to the research topic. In determining the target number of participants for the research, the researcher referred to the DUT enrollment report from 2022, which indicated that there were approximately 33 000 students enrolled at the university. Based on the guidelines provided by Sekaran and Bougie (2016), a sample size of 380 was deemed sufficient to represent a population of 33 000. This sample size allows for a reasonable level of confidence in generalising the findings from the sample to the larger population.

To obtain the necessary population data, the researcher reached out to the Management Information Systems Department at DUT. This department is responsible for managing and providing information related to the university's student population, enabling the researcher to gather accurate and reliable data for the study. By considering the enrollment report and collaborating with the Management Information Systems Department, the researcher ensured that the sample size and population data

were appropriate for the study, enhancing the validity and representativeness of the research findings.

1.6.2 Sampling method and size

In this study, a mixed methods approach was adopted, combining both qualitative and quantitative methods to gather data and analyse it. The qualitative approach was used to obtain narratives from texts and literature, allowing for a deep exploration and understanding of the topic. On the other hand, the quantitative approach involved numerical analysis to quantify and measure specific variables. To collect qualitative data, semi-structured interviews were conducted. The interviews provided flexibility for the researcher and the interviewee, allowing for in-depth discussions and exploration of the research topic. For collecting quantitative data, questionnaires were used. They allowed for standardised data collection and enabled the researcher to gather data from a larger sample size compared to interviews.

Utilising both convenience and random probability sampling aimed to create a sample that could effectively address the research questions and yield generalisable insights to other settings or populations. The sampling objective was to select a limited number of cases that would provide the most valuable information. Therefore, convenience sampling was employed to select qualitative research participants, while a simple random probability sampling strategy was used to select quantitative research participants. By employing the simple random probability sampling technique, a larger number of cases were selected in a way that collectively represented the target population more accurately.

1.7 DATA COLLECTION INSTRUMENT

In this study, the researcher utilised questionnaires and semi-structured interviews as the primary methods for data collection. For the student participants, a questionnaire was employed. It consisted of a series of questions that could respond to through an online platform. The questionnaire allowed for standardised data collection, making it easier to analyse and compare responses from different students. On the other hand, recorded online semi-structured interviews were conducted with lecturers. These

interviews involved engaging in interactive conversations with the participants, where a set of predetermined questions and prompts were used as a guide. The semi-structured nature of the interviews allowed flexibility for the participants to provide detailed insights and for the researcher to explore relevant topics in more depth.

By employing questionnaires for students and recorded online semi-structured interviews for lecturers, the researcher utilised two distinct methods of data collection. This approach enabled the collection of both quantitative data from the questionnaires and qualitative data from the interviews. The combination of these methods allowed for a comprehensive and well-rounded examination of the research topic, incorporating both numerical analysis and in-depth perspectives from the participants.

1.7.1 Questionnaire

The design of the questionnaire in this study was influenced by the information gathered during the literature review. The questionnaire was structured into three sections to cover different aspects of the research topic. Section A of the questionnaire aimed to collect demographic information from the participants. This section included questions about the participants' age, gender, and race. Gathering demographic data helped in understanding the characteristics of the sample and potentially identifying any patterns in the findings. Section B of the questionnaire focused on the activities associated with the think learn zone (TLZ). This section included a series of questions that asked the participants about their involvement in TLZ activities, such as frequency, duration, or specific tasks performed. Section C of the questionnaire addressed the participants' experiences with academic assistance in TLZ. This section included questions about the availability, usefulness, and effectiveness of academic support services within TLZ.

The questionnaire incorporated a combination of closed-ended and open-ended questions. Closed-ended questions provided predefined response options, allowing participants to choose from a set of given answers. Open-ended questions, on the other hand, allowed participants to provide detailed and free-form responses, enabling them to express their thoughts and experiences in their own words. Furthermore, a Likert scale, consisting of a five-point rating system was employed in the questionnaire.

This scale allowed participants to indicate their level of agreement or disagreement with various statements related to the research topic. By utilising a combination of closed-ended and open-ended questions, as well as the Likert scale, the questionnaire design aimed to capture both quantitative and qualitative data. This approach enabled the researcher to obtain structured quantitative data for statistical analysis and interpret participants' subjective views and experiences through qualitative insights provided in the open-ended responses.

1.7.2 Semi-structured online interviews

The use of semi-structured interviews in this study was preferred for two main reasons. Firstly, semi-structured interviews provide a relaxed environment that encourages respondents to express their views openly and in more detail. This relaxed atmosphere fosters a comfortable and conducive space for participants to share their thoughts, experiences, and perspectives related to the research topic. By allowing for flexibility in the interview process, the researcher was able to delve into specific areas of interest, seek clarification, and encourage participants to elaborate on their responses, resulting in richer and more comprehensive data. Secondly, semi-structured interviews were chosen because they offer the opportunity to gather thorough information on specific aspects of interest. In this case, the interviews aimed to explore the challenges encountered when teaching online, the impact of online learning on administrative workload, and the implications of web-based learning. By utilising semi-structured interviews, the researcher had the flexibility to ask targeted questions and delve deeper into these specific areas, allowing for a more comprehensive understanding of the phenomenon being studied. The interviews provided an avenue for participants to provide detailed accounts, examples, and insights, enabling the researcher to capture a holistic perspective of the issues at hand.

To conduct the interviews systematically, an interview schedule was created. The interview schedule consisted of a set of predetermined questions and prompts that guided the interview process. These questions were designed to address the research objectives and explore the desired topics, such as challenges in online teaching, administrative workload, and implications of web-based learning. Following the interview schedule provided structure and ensured that key areas of interest were

covered during the interviews. During the interviews, the lecturers were interviewed according to the interview schedule, allowing for consistency in the data collection process. Additionally, time was allocated at the end of each interview to provide participants with the opportunity to share any further comments or insights that they deemed important or relevant to the research topic. This allowed for additional valuable information that might not have been covered by the predetermined questions, providing a comprehensive and well-rounded view of the participants' perspectives.

1.8 DATA ANALYSIS

Data analysis is the method of scrutinising and organising raw data in order to retrieve and interpret information (Belotto, 2018). In this study, the analysis of data involved distinct approaches for the quantitative and qualitative data. For the closed-ended questions in the questionnaire, the responses were analysed using version 28.0 of the Statistical Package for the Social Sciences (SPSS). This software provided a range of statistical tests, including t-tests, descriptive analyses, frequency analyses, and correlations. By employing these statistical techniques, the researcher was able to explore patterns, relationships, and statistical significance within the quantitative data. The results of the analysis were presented using graphs and tables, which effectively displayed the findings and facilitated the communication of results. On the other hand, for the qualitative data collected through the semi-structured interviews, thematic content analysis was employed. Thematic content analysis is a method used to identify, analyse, and report repeated patterns, themes, or topics within qualitative data. It involves systematically coding and categorising the data to identify key themes and concepts that emerge from the participants' responses (Vaismoradi et al., 2016). By utilising thematic content analysis, the researcher was able to gain a comprehensive understanding of the qualitative data, identify common patterns or themes across the participants' narratives, and interpret the qualitative findings.

Answers from the closed-ended questions were analysed using version 28.0 of the Statistical Package for the Social Sciences. This software allowed the researcher to use many tests, including t-tests and descriptive analyses as well as frequency analyses, and correlations. Graphs and tables were used to display the results. This study used thematic content analysis to analysis qualitative data collected from the

participants. Thematic content analysis allowed the researcher to identify, analyse and report on repeated patterns.

By employing quantitative analysis using SPSS and thematic content analysis for qualitative data, the researcher utilised appropriate methods to analyse and interpret the different types of data collected in the study. This comprehensive approach allowed for a thorough examination of both the numerical patterns and trends in the quantitative data and the recurring themes and insights in the qualitative data, ultimately facilitating a comprehensive and in-depth understanding of the research topic.

1.9 PILOT TESTING

A pilot test is an initial exploratory investigation that is conducted before the main study to assess the research instrument's effectiveness in collecting the necessary data from participants (Majid et al., 2017). It serves as a trial run or test phase to identify any potential issues or areas for improvement in the research instrument or methodology. In this study, a pilot study was conducted using a subset of participants from the main study. Specifically, 10% of the respondents from the main study were selected for the pilot study (Grove, Gray and Burns, 2012). The participants involved in the pilot study were excluded from the main study to avoid duplication of data.

The purpose of the pilot testing was to enhance the usability of the survey instrument. By conducting the pilot study, the researcher aimed to identify and rectify any difficulties or challenges that participants may encounter while responding to the survey. This process allowed the researcher to refine the survey instrument, ensuring that participants would have no issues understanding and completing it effectively. Additionally, pilot testing provided valuable insights for the researcher. It validated the wording of the survey questions, ensuring that they were clear, concise, and comprehensible to the participants. The pilot study also helped in determining the amount of time required for each survey session, ensuring that the questionnaire was not too time-consuming or burdensome for the participants. Moreover, the pilot study generated extra data points that could be used for analysis, further strengthening the validity and reliability of the main study's findings. By conducting a pilot study, the researcher was able to identify and address any potential issues or areas of

improvement in the survey instrument. This process enhanced the survey's usability, validated the wording of the tasks, determined the appropriate time for survey sessions, and provided additional data points for the study. Ultimately, the pilot study contributed to the overall rigour and quality of the main study by ensuring the effectiveness and reliability of the research instrument and methodology.

1.10 VALIDITY

Validity in research implies to the extent to which a research tool or measuring instrument accurately measures what it intends to measure and the degree to which the obtained findings can be trusted (FitzPatrick, 2019). It is crucial to ensure that the items included in a questionnaire, test, or other measuring device accurately reflect the underlying concepts being studied (Clark and Watson, 2019). Validity is important because it establishes the credibility and accuracy of the research results. To ensure the validity of the content in this study, several measures were taken. Firstly, piloting the questionnaire with the target population was conducted. Piloting involved testing the questionnaire on a small sample of participants who are similar to the intended research participants. This process helped identify any potential difficulties or issues with the questionnaire and allowed for necessary modifications to be made before the main data collection. By piloting the questionnaire, the researcher ensured that the content was clear, relevant, and comprehensible to the participants, enhancing the validity of the questionnaire.

Furthermore, the researcher approached recognised experts in the field to obtain their opinions on the validity of the research instrument. These experts, who have expertise and knowledge in the area under investigation, were able to provide valuable insights and feedback on the validity of the tool. Their input helped ensure that the questionnaire effectively measured the intended constructs and provided a valid representation of the research topic. Conducting a preliminary investigation and seeking expert opinions early in the research process allowed for the identification and resolution of any potential limitations or weaknesses in the research technique. This proactive approach enhanced the validity of the questionnaire by addressing any issues and ensuring that the measuring instrument accurately reflected the concepts being studied.

1.11 RELIABILITY

Reliability encompasses the capacity to replicate or reproduce outcomes or observations (Belur et al., 2021). The objective of reliability testing is to ensure that the instrument being utilised remains dependable and resistant to alterations in the researcher, respondents, or the sequence of the study (Mueller and Knapp, 2018). Babbie (2020) posits that if the techniques and analysis employed are highly relevant, the findings of a research study will likely be more reliable. However, it should be noted that reliability does not necessarily equate to accuracy. This implies that even though a study may yield consistent findings, it may still contain errors. To maintain consistency in research, Amirrudin, Nasution and Supahar (2021) recommend that respondents provide consistent answers when confronted with the same question, irrespective of any differences in phrasing. This aspect indicates the dependability of the research instrument, given that the responses remain consistent across multiple observations under unchanged conditions.

In order to enhance the reliability of the research instrument, careful attention was paid to formulating each question in the questionnaire with a high degree of clarity and precision, aiming to minimise any potential confusion. Furthermore, the study acknowledged that larger sample sizes generally result in more reliable findings, assuming all other factors remain constant. To ensure reliability, standardised questionnaires were employed, and clear instructions were provided to the respondents prior to their completion of the questionnaire, to the best extent possible.

1.12 ANONYMITY AND CONFIDENTIALITY

In research, anonymity refers to a practice that ensures the respondents' identities cannot be identified by the readers or anyone else involved in the research process. It is an important ethical consideration in protecting the privacy and confidentiality of participants (Hoft, 2021). To safeguard the privacy of the human subjects participating in the study, the principles of anonymity and confidentiality were adhered to. Anonymity was maintained by ensuring that the respondents' identities remained undisclosed throughout the research process. This means that their names or any personally identifiable information were not linked to their responses or reported in any way that

could reveal their identities. Confidentiality, on the other hand, involves protecting the participants' information and ensuring that it is kept secure and accessible only to authorised individuals involved in the research (Kamanzi and Romania, 2019). Participants were assured that their responses and personal information would be treated with utmost confidentiality. This includes the storage, handling, and transmission of data, ensuring that it remains protected from unauthorised access.

1.13 ETHICAL CONSIDERATIONS

Ethical considerations encompass the principles and guidelines that govern the responsible and ethical conduct of research. These considerations are implemented to safeguard the rights, well-being, and dignity of the individuals or groups involved in the research process. They establish a framework for researchers to ensure that their studies are conducted in an ethical and morally upright manner (Babbie, 2010). In line with these principles, this study obtained ethical approval from the Faculty Research Ethics Committee at DUT. Participants were provided with comprehensive information about the study and were required to sign an informed consent form prior to their participation. As the study primarily focused on the cognitive domain and involved survey questions without any testing, participants were not subjected to any harm. The research process adhered to DUT's Research Ethics Policy and Guidelines (2015), addressing aspects such as informed consent, deception, recruitment, participant risk, sponsorship and benefits, confidentiality, conflicts of interest, and indemnity. Participants received a consent form (Appendix 2), a letter of information, and questionnaires (Appendix 1) as part of the study process, ensuring that the ethical considerations were adequately addressed and guided the researcher throughout the research journey.

1.14 STUDY LIMITATIONS

Research limitations are conditions or factors that could have an impact on the study's findings and conclusions but are out of the researcher's control (Simon and Goes, 2013). In this study, the main limitations are associated with the effects of the Covid-19 pandemic and the specific sample selection. The Covid-19 pandemic had a significant impact on the research process. Originally, the plan was to administer the

survey physically to the participants. However, due to the lockdown measures implemented at the university, the researcher had to adapt and conduct the survey online. This change in the questionnaire administration method introduced limitations, such as the inability to directly interact with participants during the data collection process. Another limitation was related to the sample selection. The study only included participants from DUT, which means that the findings and conclusions may not be generalised to other universities or educational contexts. The specific characteristics and circumstances of DUT may differ from other institutions, which can limit the generalisability of the study's findings. However, it is important to note that the results can still provide valuable insights and recommendations for enhancing web-based teaching and learning practices across different institutions, as they serve as a case study for understanding the effectiveness of such approaches.

1.15 OVERVIEW OF CHAPTERS

This research study consists of six chapters.

Chapter 1: Introduction and Overview of the Study

This chapter introduces and provides a detailed background of the study. Research aim, objectives, and significance of the study are presented.

Chapter 2: Literature Review

Chapter 2 presents a review of the available literature on web-based teaching and learning. The importance of technology in education and challenges associated with this type of learning have also been addressed. The researcher's discussion of the findings in Chapters 4 and 5 was aided by the literature review.

Chapter 3: Theoretical Framework

This chapter provides a detailed theoretical framework in support of this study.

Chapter 4: Research Methodology

This chapter details the research methodology and design employed in this study. Research method, target population, sampling, data collection, and data analysis are discussed. The ethical foundations of the research are also discussed in this chapter.

Chapter 5: Findings, Interpretation and Discussion

This chapter presents the findings gathered and interprets these findings in relation to the aim and objectives of the study. The findings were analysed and presented using graphs, tables, and charts.

Chapter 6: Conclusion and Recommendations

This chapter provides the conclusion and recommendations of the study. Contributions of the study and areas for further research are also discussed.

1.16 CONCLUSION

This chapter of the study established the study's background, research problem, and the context of web-based learning. It introduced the aim, objectives, and research question formulated to address the objectives, emphasising the study's significance. The following chapter provides a comprehensive literature review focused on the management of activities linked with web-based. It examined relevant scholarly articles, research studies, and theoretical frameworks to explore the concepts, strategies, benefits, and challenges associated with web-based learning.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The previous chapter presented the contextual and theoretical background that motivated the present study. This information played a crucial role in helping the researcher formulate the research problem statement, which is followed by the research objectives and questions. In order to examine the main topics that are pertinent to the study, this chapter assesses the existing state of knowledge regarding the important concerns raised by the research problem. The purpose of the literature review is to systematically gather and synthesise prior research related to the key issues raised by the research problem (Snyder, 2019). Reviewing existing literature is an essential component of the research process as it helps generate ideas and formulate critical questions (Hart, 2018).

The current research focuses on the management of activities related to web-based LMSs, with the primary objective of examining the effectiveness of web-based teaching and learning, identifying the challenges associated with this approach, and exploring the correlation between academic activities and students' performance. To achieve these objectives, the researcher conducted a comprehensive literature review. The literature review aimed to understand the nature and extent of web-based LMSs regarding the management such systems, specifically in the context of higher education. Through the literature review, the researcher gained insights into the various methods and approaches used by researchers in the field of web-based teaching and learning. The review helped identify and discuss different strategies, techniques, and tools employed to enhance web-based learning experiences. Additionally, it provided an overview of the current state of knowledge regarding the management of web-based learning in the delivery of courses in South African universities. Furthermore, the literature review allowed the researcher to identify gaps in the existing research.

2.2 TECHNOLOGY IN EDUCATION

Education is the most important aspect in fostering communities and guaranteeing that their living conditions are improved (Borup et al., 2020; Wassell, Wesely and Glynn, 2019). Bharucha (2018) defines technology in education as the integration of diverse technological tools and resources into the teaching and learning process. This includes the use of hardware such as computers, laptops, tablets, projectors, and smartphones, as well as software and applications such as LMSs, educational apps, and online resources. Multimedia resources such as videos, audio recordings, and interactive simulations can also be utilised to enrich the learning experience and engage students in innovative ways (Tang et al., 2021). The incorporation of technology in education holds the potential to enhance the accessibility, flexibility, and personalisation of learning, while simultaneously improving the efficiency and effectiveness of teaching and assessment (Lanka, 2021). By embracing technology, learning becomes more readily available to a broader range of individuals. It also provides flexibility in terms of where and when learning can take place, enabling students to learn at their own pace and convenience (Ferri, Grifoni and Guzzo, 2020). Thus, technology facilitates personalised learning experiences tailored to individual needs and preferences and has the capability to optimise teaching and assessment methods, making them more efficient and effective (Alamri, Watson and Watson, 2021).

The integration of technology has significantly transformed the lives, work, and learning experiences of students and lecturers (Oke and Fernandes, 2020). As a result, instructional technology has rapidly progressed over the years. Raja and Nagasubramani (2018) propose that technology is employed in education in four distinct ways as: a constituent of the curriculum, a strategy for teaching, a tool for facilitating instruction, and a means of enhancing the overall learning experience. While some definitions of technology solely revolve around hardware, others encompass the use of this equipment to address problems (Oztemel and Gursev, 2020). La Shun (2020) defines technology as the effective and precise application of ideas derived from behavioural and physical sciences, as well as other fields of knowledge, to solve problems. Similarly, Balalle (2019) characterises educational technology as a methodical and organised approach to utilising contemporary technology to improve educational outcomes.

Educational technology enables various activities such as reading, coaching, implementing new teaching techniques, and designing instructional procedures and assessments (Shahid et al., 2019). According to Kebritchi, Lipschuentz, and Santiago (2017), different technologies employed in an online classroom serve distinct purposes and convey different types of knowledge. For instance, word processing and email enhance communication skills, while database and spreadsheet programmes develop organisational abilities. In contrast, modelling software facilitates comprehension of scientific and mathematical principles (Braiek and Alatresh, 2019). Therefore, it is crucial to evaluate the differences between electronic technologies and understand the qualities that make them effective as educational tools (Yang et al., 2020). By examining the unique features and capabilities of different technologies, lecturers can make informed decisions about their integration into teaching and learning processes.

2.3 IMPORTANCE OF TECHNOLOGY IN EDUCATION

Technology has become an integral part of our daily lives and has revolutionised the way individuals can access and disseminate information (Raja and Nagasubramani 2018). In the field of education, technology has become a vital tool for both lecturers and students. The importance of technology in education lies in its ability to enhance the learning experience and provide students with new and innovative ways of learning (Lawrence and Tar, 2018). With technology, students can access a wealth of information that was once unavailable to them, and they can do so at their own pace and in their own time. In addition, technology has made it possible for lecturers to personalise the learning experience for each student, allowing them to tailor instruction to meet the needs of individual students (Alam, 2021). Technology has also made it easier for students and lecturers to collaborate and communicate with one another, regardless of their physical location (Bower, Lee and Dalgarno, 2017). In short, technology has transformed the education landscape, making it more accessible, engaging, and effective for all students. The use of technology in education has transformed it in a number of ways such as:

- i. *Online learning*: Technology has made it possible for students to attend classes and complete coursework online, providing greater flexibility and access to

education. This has particularly benefited students who live in remote areas or have scheduling conflicts.

- ii. *Interactive and engaging learning:* With the use of technology, classes can be more interactive and engaging, making the learning experience more enjoyable for students. For example, lecturers can use multimedia presentations, simulations, and virtual reality experiences to make lessons more interactive and memorable.
- iii. *Personalised learning:* Technology has made it possible for students to receive customised and tailored instruction that is specific to their learning needs and styles. This can help students to learn at their own pace and to focus on areas where they need more support.
- iv. *Access to information:* Technology has made a wealth of information available to students, enabling them to research topics and expand their knowledge in ways that were not possible in the past.
- v. *Collaborative learning:* Technology has made it easier for students to collaborate and communicate with each other, regardless of their location. This has led to the development of virtual study groups, online discussion boards, and other tools that encourage collaboration and teamwork.

The significance of technology in the field of education cannot be over emphasised. It is being employed to tackle numerous problems and issues in the education industry (Arkorful and Adaidoo, 2014). As a result of its advantages, electronic learning (e-learning) is regarded as one of the most effective education methods, particularly in universities (Al Rawashdeh et al., 2021). Technology has brought several positive transformations to education, and it is expected to continue doing so in the future. However, it is crucial to use technology in a responsible and efficient way, and to ensure that students do not become excessively dependent on it for their learning (Al-Kumaim et al., 2021).

2.4 LEARNING MANAGEMENT SYSTEM

Information communication and technology (ICT) encompasses a range of digital technologies and communication tools like computers, smartphones, the internet, social media, and software applications to create, process, store, and exchange information (Demestichas and Daskalakis, 2020). Its application is vital in facilitating communication, information sharing, and collaboration between individuals and organisations across different locations and time zones (Szymkowiak et al., 2021). In higher education institutions (HEIs), the widespread use of ICT has led to an increased reliance on the internet for various tasks by both students and lecturers. Moreover, the integration of technology in education has revolutionised the learning experience for students and provided lecturers with tools that enhance teaching and learning.

According to Ghilay (2017), LMSs are web-based platforms utilised in HEIs and other instructional methods for course administration, recording, observation, reporting, and delivery. Laflen and Smith (2017) also highlight that LMSs distribute and manage educational content while handling student registration, online administration, tracking, and evaluation of students' work. Likewise, lecturers can use an LMS to design and deliver content, track student involvement, and evaluate performance. LMSs are also known as course management systems (CMS), learning content management systems (LCMS), virtual learning environments (VLE), virtual learning systems (VLS), learning portals, or e-learning platforms (Sus et al., 2020).

LMSs offer various interactive features, including discussion boards, video conferencing, and threaded discussions (Dailey-Hebert, 2018). These platforms serve as online portals that connect lecturers and students, enabling easy sharing of classroom materials and facilitating interaction outside of the traditional classroom setting (Ghosh et al., 2019). Bradley (2021) argues that LMSs are suitable for both full-time and part-time education, providing a structured framework for lecturer-student interaction. As a result, with the increasing availability and accessibility of the internet, both students and lecturers may access coursework through LMSs more easily than ever before (Gillis and Krull, 2020).

There are three main types of LMSs, namely: proprietary, open-source, and cloud-based. Proprietary LMSs, such as D2L, eCollege, and Blackboard, require users to purchase licences, and vendors typically generate revenue from their sale. Open-source LMSs, such as Moodle, Sakai, and Canvas, make their source code publicly available for free use by all users. Cloud-based LMSs have emerged as a convenient and cost-effective solution for higher education institutions to use a variety of cloud-based applications (Dobre, 2015).

2.4.1 Learning Management Platforms

There are many LMS available, the most popular of which are discussed below.

2.4.1.1 Moodle

In 1999, Martin Dougiamas introduced Moodle which was officially released in 2002 as Moodle 1.0. Moodle stands for modular object-oriented dynamic learning environment (Fadel et al., 2019). Kita et al., (2018) report that Moodle is a free open source LMS that is used by more than 400 000 registered users in 193 countries and does not require any registration or yearly renewal costs. With Moodle, lecturers, administrators, and students can create personalised learning environments in a single, secure, and integrated system (Ghosh et al., 2019). This platform is designed to facilitate online learning and allows for the easy integration of various learning support features into an online learning portal (Ventayen and Orlanda-Ventayen, 2018).

Moodle LMS encompasses various features that can facilitate the integration of global learning (Alragawi and Zahary, 2018). In the context of Moodle, courses serve as virtual spaces where lecturers can upload resources and assignments for students to complete (Mpungose, 2020a). This adoption is not only in line with technological advancements in higher education but also enables collaboration with other institutions. Furthermore, Moodle provides a flexible and practical solution for students who require academic support without compromising the quality of education (Sun et al., 2020). DUT, along with other South African HEIs, has adopted Moodle as its online LMS, serving as a platform for teaching and learning.

Several features of the Moodle LMS can be used to support the use of e-learning, namely:

- i. Common characteristics
- ii. The executive features
- iii. The capabilities for managing and developing courses (Chang, Li and Huang (2022)).

2.4.1.2 Microsoft Teams

Microsoft Teams is a cloud-based software application that integrates meetings, discussions, apps, and files into a single LMS (Microsoft, 2018). This technology is suitable for both the entire university and specific programmes and has been used in professional settings as well as for in-person, online, and hybrid courses (Jacques, Ouahabi and Lequeu, 2021). Users have reported that this application offers easy access and capabilities for meetings, video conferencing, and file storage (Ilag, 2021). Teams also offer a wide range of third-party app integrations, such as Trello, Salesforce, and Adobe Creative Cloud, enabling users to work with a variety of tools and services from within the Teams environment. Users can create and manage online classes in the same way as in-person classes, with students being able to communicate with teachers and other students through online group chats, posts, assessments, and class meetings (Buchal and Songsore, 2019). Microsoft Teams also ensures the security of user data within the programme (Henderson et al., 2020). Given its features and conveniences, Microsoft Teams is an excellent programme to use as a platform for online learning (Chat and Calling, 2021).

2.4.1.3 Blackboard

Blackboard is a web-based LMS that provides a virtual learning environment for students and lecturers. It was created by Blackboard Inc., a company that specialises in educational technology, and is used by many educational institutions around the world (Aldiab et al., 2019). Blackboard offers a range of features that allow lecturers to create and manage online courses, including tools for creating and delivering course content, managing assignments and assessments, and facilitating communication and

collaboration among students. It also includes features for tracking student progress, managing grades, and generating reports (Alturise, 2020). Blackboard has evolved over the years to include a variety of different products and services, such as Blackboard Collaborate for online meetings and virtual classrooms, Blackboard Open LMS for open-source learning management, and Blackboard Ally for improving the accessibility of course content (Liu, Lomovtseva and Korobeynikova, 2020).

Lecturers can demonstrate real-world applications online, as well as assist and lead students through the process of analysing real-world issues, acquiring data, testing validity and applicability, and producing meaningful solutions (Marchewka and Kostiwa, 2014). With the extra benefit of a clear and justified grading system, the Blackboard system allows students to communicate with their lecturers in the most efficient and productive way possible. Blackboard is an example of an "LMS that offers certain benefits that can improve certain key competences, personal development and interpersonal collaboration as a whole" (Lyashenko and Frolova, 2013).

Blackboard can be used to communicate important information about courses such as announcements and discussions, as well as providing a virtual classroom and e-mail links, as well as serving as a source for course material and a forum for online learning and student activities (Alokluk, 2018). However, a study by Almekhlafy (2020) argues that although adopting Blackboard offers many advantages, certain downsides have also been noted in various studies. One of the major drawbacks of the blackboard is its limited space. Blackboards are fixed in size, and once the board is filled up, there is no space left to write. This can be particularly challenging for lecturers who have a lot of information to convey, especially when teaching complex topics (Phejane, 2022). Additionally, blackboards are not very versatile or dynamic. Unlike digital tools, blackboards cannot display multimedia content or interactive elements, which can make the learning experience less engaging and interactive for students. This limitation can be particularly challenging when teaching abstract concepts or topics that require visual aids or interactive elements to convey their meaning effectively (Straub, 2022).

2.4.1.4 Canvas

Josh Coates established Canvas in 2008 and released it in 2011 (Aldiab et al., 2019). The main goal behind developing Canvas was to provide an efficient and reliable interface for online learning, which could save time. Mpungose and Khoza (2020) suggest that Canvas offers a broad range of features that cater to various aspects of the learning process, such as grading, course delivery, managing discussions, submitting assignments, and administering tests. Most of Canvas' features are accessible through a web-based application, while some can also be accessed through native Android and iOS mobile apps (Osvath, 2018).

Canvas is praised for its openness, dependability, cloud-native architecture, and ease of usage, and it is embraced faster and more widely than other LMSs (Wicaksono et al., 2021). Canvas offers a wide range of templates, graphics, photos, and fonts that users can use to customise their designs (Gehred, 2020). Additionally, it has collaboration features that allow multiple users to work on the same design simultaneously. Canvas' pricing is also affordable, with a free version and paid plans with more features. However, Canvas also has some disadvantages. Its free version has limited features, and users may need to purchase a paid plan to access more advanced tools. Canvas' templates and design elements may also be limiting for users who want to create truly unique designs. Furthermore, Canvas' cloud-based platform may present security concerns for users who need to protect sensitive information (Avella et al., 2016).

2.4.1.5 Desire2Learn

Desire2Learn (D2L) was established by John Baker in 1999 (Kausar et al., 2020). D2L is an online LMS that is both synchronous and asynchronous, enabling communication and interaction between professors, students, and their courses (Amin and Mohammed, 2018). D2L is an e-learning platform that helps lecturers achieve their objectives and aspirations, benefiting students worldwide, particularly those in higher education and other institutions (Aldiab et al., 2019).

D2L provides various tools, including content files, conversations, forums, quizzes, and grades, for users to evaluate and assess its teaching and learning materials (QuickStart D2L Guide, 2012). Furthermore, documents and movies can be accessed and downloaded online. D2L hosts discussion boards where lecturers, students, and their classmates can discuss course materials and ask questions. D2L also offers statistics and reports to support programme administrators and staff in achieving department and university accreditation, as highlighted in the study by Amin and Mohammed (2018).

2.4.2 Advantages and disadvantages of LMSs

The use of information technology (IT) in education has been viewed as innovative, with computers serving as essential tools to attain educational objectives (Korhonen, Ruhalahti, and Veermans, 2019). IT is being utilised to address various issues and challenges, and e-learning is considered one of the most efficient instructional methods, particularly in HEIs, owing to its many advantages and benefits (Arkorful and Adaidoo, 2014).

2.4.2.1 Advantages of LMSs

Some of the most important benefits of IT in the field of education include the following:

- i. *Organises e-learning content in one location* - Storing all e-learning resources in one place can be beneficial as it reduces the risk of losing important data and makes it easier to develop an e-learning course. By utilising a cloud-based LMS, all the data is stored on a remote server and can be accessed by all members of the e-learning team. This makes learning management systems ideal for online collaboration (Tabakova, 2020).
- ii. *Provides unlimited access to e-learning materials* – Uploading e-learning course materials to an LMS and publishing them allows both students and lecturers to have unrestricted access to the data they need. This means that individuals can utilise the e-learning platform on their smartphones and tablets to improve their skills and complete job-related tasks at any time, without having to wait for their

next online training session. This feature is especially important for students who are located across time zones, making an LMS a necessary tool for their success (Naveed and Ahmad, 2019).

- iii. *Intensify the educational system* - The use of information technologies has significantly contributed to the advancement of the educational system, impacting various aspects of education. This includes teaching and learning methods, educational techniques, the adoption of active learning, personalised and diversified instructional approaches, the use of cognitive exercises with audio and video materials, assessment for control, and the incorporation of self-regulation as a system of equations. In higher education institutions, the use of videos in class presentations or student research projects can help students better understand the subject matter. The ability of students to acquire more knowledge and information is essential, enabling them to excel academically and achieve their goals (Rabiman, Nurtanto and Kholifah, 2020).
- iv. *Increase in creativity* - The integration of technology in projects, tasks, and other activities can foster creativity among both students and lecturers. For instance, students working on an assessment about the use of technology in education can enhance their project by adding photographs of various technologies to make it more engaging. There are countless other tasks and activities that can benefit from the use of technology, such as creating charts, tables, graphs, running heads, page numbers, headers, and footers, using colour, and adjusting the text size. These features offer greater flexibility in presenting information and allow for more customisation and creativity in academic work (Noreen, 2020).
- v. *An increase in the number of tasks done* - Using this technology it is possible to control how tasks and assignments are carried out. The usage of technology reduces monotony and motivates people's minds towards learning and work completion (Nurakun Kyzy, Ismailova and DüNDAR, 2018).

- vi. *Enhanced academic learning* - Students enrol in academic institutions primarily to advance their knowledge and comprehension of topics. Individuals' learning capacities determine how and how quickly they can improve their technological knowledge. Computer programmes are largely developed for self-active perception and help students supplement their academic learning, which is one of the main aspects and benefits of IT (Nurakun Kyzy, Ismailova and Dünder, 2018).
- vii. *Increase motivation* - Students and other workers are more motivated to complete their work when technology is used in teaching and learning methods or to carry out administrative, technical, and administrative tasks. People typically view the enormous knowledge made available on the internet as beneficial for raising inspiration and energising people's thoughts. Learning can take many different forms with the help of technology. These include reading articles, typing assignments, preparing presentations with Power Point, preparing spreadsheets with Excel, and so forth. Individuals can also engage in leisure and recreational activities by playing games and utilising technology. Individuals who are unfamiliar with technology may feel vulnerable and uncomfortable at first. However, if they have good knowledge, they are usually eager to learn more (Alizadeh, 2019).
- viii. *Augmenting operational decision-making skills* - When people use technology extensively, they can enhance their ability to make operational decisions. This is frequently the case for students attending universities. When students are registered for an academic programme, they are required to give a presentation. Classrooms, workshops, conferences, and seminars are common venues for presentations. Individuals can write papers and offer their ideas in that format, or they can create PowerPoint presentations. Students can make decisions about how they will organise their presentations (Morze et al., 2021).
- ix. *Research* - Education is thought to be incomplete without research. It is critical not only in higher education but also in preschools. There are three different ways to conduct research. Utilising documents, articles, books, and other

reading materials is the first technique. The second strategy involves using technology and the internet. Completing field research is the third technique. Individuals can improve their knowledge and understanding by using reading resources. Most of the field research is carried out by researchers on the ground. They travel to different locations and collect data through questionnaires, field notes, and interviews. Online resources like articles, documents, projects, reports, assignments, and photos on a wide range of topics can help people comprehend concepts better (Rahman, Daud and Ensima, 2019).

- x. *Communication* - All people consider communication to be an essential element of their life. People interact with one another in both formal and informal settings. Personal and professional communication are both feasible. The usage of technology is extremely important in facilitating communication processes. Email is sent and received via computers and laptops. Mobile technology, such as cellphones and smartphones facilitate communication. People can interact with one another, send messages, reports, images, videos, and other documents, as well as pay bills, make purchases, and sell goods. It is critical for individuals to instil morality and ethics while also making efficient use of technology in order to communicate effectively. People need to make sure that information is precise and concise, especially when communicating in writing (Rahman, Daud and Ensima, 2019).

2.4.2.2 Disadvantages of LMS

Despite the benefits of LMS in the classroom, it also has several disadvantages, such as:

- i. *Technological barriers* - For students, particularly those in remote areas, access to computers and technological equipment, as well as the internet, may be a struggle. There are many universities and community colleges in rural regions. Poor internet access results in students not being able to view all the displays on a webpage (Kraleva et al., 2020).

- ii. *Lack of moral value implementation* - Most websites and software now under development lack moral value implementation. Without the use of web-enabled technologies, data cannot be processed over the internet (Al-Handhali, Al-Rasbi and Sherimon, 2020).
- iii. *Social isolation* - Due to the learners' freedom in terms of time and location, learners in LMS classes often study alone, which might lead to a sense of social isolation over time. Online discussion groups have a social structure that is distinct from that of a face-to-face small group (Muruthy and Yamin, 2017).
- iv. *Cost* - Balancing the significant initial costs linked to introducing online learning can yield potential cost efficiencies. Although the process of transforming course materials like syllabi, lectures, or outdated textbooks into web-based formats may seem straightforward, such conversions rarely lead to genuinely effective educational outcomes. (Jaya, 2019).
- v. *Ineffective instructional design* - In all teaching situations the quality of instructional design varies. Unlike a face-to-face education where a skilled lecturer can teach with little preparation, web-based teaching must be expressly designed and implemented (Jaya, 2019).

2.5 WEB-BASED TEACHING AND LEARNING

Web-based teaching and learning (also known as online or distance education) refers to the use of the internet and related technologies to deliver educational programmes and courses. In this type of learning, the lecturers and students are not in the same physical location, but rather communicate and interact with each other through various online platforms and tools (Francisco, 2020). ICT devices have become essential due to their ability to provide a fresh way of connecting, communicating, and collaborating with one another in our everyday routines (Suartama, Setyosari and Ulfa, 2019). Smartphones, cloud computing, wireless networking, and electronic gadgets are among the new products that have emerged as the main advocates and accelerators of the e-learning paradigm (Muthuswamy, 2022).

The use of ICT offers universities various opportunities to enhance their educational systems, cater to students' needs, and prepare them for future challenges (Das, 2019). Many universities have adopted LMSs in combination with traditional teaching methods (Maslov, Nikou, and Hansen (2021). Holland (2016) highlights that the ubiquity of ICT allows for easy integration into conventional courses, improving traditional learning and students' capacity to self-learn beyond curricular schedules. Self-regulated activities provide an effective learning environment that facilitates sharing knowledge and experiences between students and lecturers (Almoeather, 2020). Liaw and Huang (2013) suggest that improving positivity within the learning environment increases learners' eagerness to learn and their inclination to use technology for learning.

Fahad, Hassan, and Salman (2013) argue that despite the wealth of literature on the benefits of e-learning in universities, initial investigations indicate that e-learning systems are not being used to their full potential. This has led to discussion of the effectiveness of online versus face-to-face classrooms in online-education literature (Dwidienawati et al., 2020). While technology is now commonly used in education, it is often used to enhance the efficiency of existing learning methods, rather than as an element of new strategies to improve effectiveness (Lee et al., 2018). Zanjani (2017) emphasises that it is critical to understand how these tools are utilised and how they affect users if we want to improve educational practice. Researchers from various fields are working to enhance students' online learning experiences, and one concern that is causing alarm is learners' perceptions of online learning (Wei and Chou, 2020). The shift towards online learning, accelerated by global events, has raised questions about its effectiveness and overall impact on student engagement and success. Understanding learners' perceptions is crucial as it can shape the design of online courses, influence teaching methodologies, and help institutions make informed decisions (Salas-Pilco, Yang and Zhang, 2022). Addressing this concern involves investigating factors such as students' satisfaction with online platforms, their feelings of connectedness to lecturers and peers, and their confidence in the quality of digital learning resources. By delving into these perceptions, researchers aim to refine the online learning environment, making it more conducive to effective education and ensuring that it aligns with students' needs and expectations.

There are four components of university students' perceptions of web-based learning environment: a multimedia teaching environment, an effective learning environment, a lecturer-led learning environment, and a self-paced learning environment (Kumar et al., 2021). Wei and Chou (2015) employed the self-determination theory (SDT) of Deci and Ryan (1985) as a theoretical foundation for comprehending university students' perception of, and individual motivators for, online learning. According to Deci and Ryan (1985), SDT is a psychological framework that explores human motivation and the factors that drive behaviour. It posits that people have innate psychological needs for autonomy (the desire to have control over their actions), competence (the need to feel capable and effective), and relatedness (the need for social connections and relationships). According to SDT, when these basic needs are satisfied, individuals are more likely to be intrinsically motivated, meaning they engage in activities because they find them inherently rewarding and fulfilling. In contrast, when these needs are thwarted, people may become extrinsically motivated, relying on external rewards or pressures to perform tasks.

2.5.1 Students' perceptions of web-based learning

Muthuprasad et al., (2021) state that it is crucial to take students' preferences and impressions into account when creating online courses. The readiness or willingness of students to engage in collaborative learning, as well as the variables that affect readiness for online learning, are related to their preferences (Koh and Kaan, 2021). Werner et al., (1998) developed the idea of preparedness for online learning which comprises three elements:

- i. Students' preference for online delivery over face-to-face learning in the classroom.
- ii. Students' self-assurance in their ability to communicate effectively utilising laptops and the internet for the purpose of education.
- iii. The capacity to learn independently.

Research indicates that students have a mix of favorable and unfavorable attitudes towards online learning, and the manner in which lecturers engage with them can significantly impact these sentiments (Aditya and Jha, 2020). The existing body of literature highlights several factors that can play a crucial role in shaping students' perceptions of online education. For example, Xu, Chen, and Chen (2020) contend that online learning offers learners the opportunity to partake in self-paced and personalized learning within a more adaptable and convenient setting. Furthermore, Vlachopoulos and Makri (2019) propose that online learning harnesses both synchronous and asynchronous communication technologies to enhance the quality and quantity of interactions among students, lecturers, and peers.

Milheim (2012) suggests that providing consistent course formatting and interface/material design can help students overcome difficulties in preparing for an online classroom. Consistency can also help students anticipate what to expect as they navigate multiple online classrooms (Lemov, 2020). However, this does not mean that all online classrooms should use the same media and activities. Milheim (2012) recommends incorporating varied media and information, as well as learning activities, to capture and maintain students' attention. However, Kearns (2019) cautions that this should be done with a carefully selected and pre-determined set of media, in order to maintain an organised environment that does not deviate too far from what students are accustomed to.

2.5.2 Student engagement and learning outcomes

In recent years, HEIs have increasingly used ICT to provide online instruction, resulting in a variety of learning environments and contexts for students (Ferrer et al., 2020). Researchers in this field have focused on how students engage with web-based learning (Chen, Jiao, and Hu, 2021). Engagement in learning is a student-centred approach that emphasises the student's connectedness (Axelson and Flick, 2010), involvement (Kuh et al., 2008; Sun and Rueda, 2012), as well as the effort, energy, and time they put in (Krause and Coates, 2008; Kuh and Hu, 2001; Reschly and Christenson, 2012; Robinson and Hullinger, 2008). Student engagement is composed of several constructs, including behavioural, emotional, and cognitive.

Student engagement is a critical aspect of the learning process that can significantly impact the achievement of learning outcomes. When students are actively engaged in their studies, they are more likely to develop a deeper understanding of the subject matter, retain information, and apply what they have learned (Yu, Gao and Wang, 2021). According to Kim, Hong and Song (2019), engaged students are also more motivated, committed, and persistent, which can lead to higher academic performance and success in their future careers. In contrast, students who are disengaged or disinterested in their studies may struggle to learn and achieve their academic goals. They may lack motivation, find it challenging to focus on their studies, and may even drop out of school altogether (Davis, Spring and Balfanz, 2022). Such outcomes can have long-lasting negative consequences on students' personal and professional lives.

Kahu and Nelson (2018) propose a conceptual framework for engagement that considers both institutional and student variables, with the university environment playing a crucial role in shaping student engagement. Ferrer et al., (2020) note that numerous technologies are currently being used in online learning to support students and improve their engagement, retention, and knowledge. Student engagement and learning outcomes are key factors in the success of web-based learning. Therefore, well-designed web-based learning environments have the potential to provide students with flexibility and convenience, while also fostering engagement and promoting learning outcomes (Chakraborty and Muyia Nafukho, 2014). There are many strategies that can be used to enhance student engagement and learning outcomes in web-based learning, and lecturers can ensure that students have a positive and productive online learning experience by carefully designing and implementing the following strategies:

- i. *Active learning*: Encouraging students to participate in online discussions, complete online quizzes, and assignments, and collaborate with peers can help to keep students engaged and promote learning (Tanner, 2013).
- ii. *Personalisation*: Customising the online learning experience to meet the individual needs and preferences of each student can help to increase engagement and learning outcomes (Nagro et al., 2018).

- iii. *Immediate feedback*: Providing students with immediate feedback on their performance can help to keep them motivated and improve their learning outcomes (Ross et al., 2018).
- iv. *Interactivity*: Incorporating interactive elements into the online learning experience, such as simulations, games, and virtual environments, can help to keep students engaged and promote learning (Barkley and Major, 2020).
- v. *Accessibility*: Ensuring that online materials are accessible to all students, regardless of ability, can help to promote engagement and learning outcomes for all students (Khan et al., 2017).

Therefore, it is crucial for lecturers to prioritise student engagement in the classroom by creating a positive and inclusive learning environment that fosters active participation, collaboration, and critical thinking. This can be achieved through various teaching strategies, such as incorporating real-life examples, encouraging discussions, providing opportunities for experiential learning, and using technology to enhance learning.

2.5.3 The relationship between academic assistance/engagement and student performance in web-based learning

The widespread use of ICT infrastructure in higher education has resulted in significant adjustments to organisational and administrative processes as well as pedagogical practices (Oliveira et al., 2021). The relationship between academic assistance and student performance in web-based learning is a complex one and may depend on a variety of factors, such as the quality of the online platform, the level of support provided by the institution, the motivation of the students, and the complexity of the course material (Liu, Lomovtseva and Korobeynikova, 2020). However, studies have shown that good academic assistance and engagement practices, including timely communication between lecturers and students, consistent and clear course goals, and efficient time management techniques, can have a positive effect on students' performance in online learning (Madigan and Kim, 2021).

Academic assistance can come in different forms in web-based learning, such as online tutoring, academic counselling, peer support, and feedback from lecturers (Alam, 2021). When students receive academic assistance, it can help them to clarify concepts, fill knowledge gaps, and overcome challenges that they may face in their coursework (Tang, Tseng and Tang, 2022). Academic assistance can help students to perform better in their academic tasks and assessments. On the other hand, poor administration or a lack of assistance may have a detrimental effect on students' academic achievement (El Said, 2021). The nature of web-based learning can bring difficulties for both students and lecturers, including technical difficulties, a lack of organisation, limited face-to-face connection, lack of administrative support (Agustina and Cheng, 2020; Stone, 2019). However, these obstacles can be overcome if they are properly addressed (Stone, 2019). While the correlation between academic assistance activities and student performance in online learning is complex and multifaceted, effective support and administration can positively impact student success.

Overall, academic assistance and engagement are important factors that can contribute to student performance in web-based learning. Therefore, it is crucial for lecturers and institutions to provide effective support and opportunities for student engagement to maximise their learning outcomes.

2.6 BLENDED LEARNING

Blended learning has become a popular method and approach to course design in higher education (Suartama, Setyosari and Ulfa, 2019). While there are several definitions of blended, Graham et al., (2019) refer to it as being a balanced combination of online and face-to-face learning. Blended learning integrates face-to-face and remote learning frameworks, but this is not simply projecting a webpage onto a screen. The blended learning environment aims to maximise the benefits of both online and face-to-face learning (Herbert et al., 2017). Since the early 2000s blended learning has become widely accepted in education (Haq et al., 2018). Blended learning in the 21st century has gone far beyond the initial methods of distance education, which relied on correspondence-style courses, video conferencing, and educational television programmes (Rasheed, Kamsin and Abdullah, 2020).

Over the past ten years, blended learning has transcended its origins in higher education and has gained increasing prominence in secondary education as well. Secondary education refers to the educational level that follows primary or elementary education and typically encompasses middle school and high school levels, where students are in their adolescent years. Blended learning in the secondary education context involves integrating both traditional face-to-face classroom instruction and digital or online components (Cobo-Rendón et al., 2022). This approach recognises the evolving needs of students in the 21st century, who are accustomed to technology and benefit from the flexibility of accessing educational materials and resources through digital platforms. Blended learning in secondary education aims to create a more personalised and engaging learning experience by allowing students to explore content at their own pace, collaborate with peers, and receive individualised support from lecturers, all while maintaining a connection to the structured classroom environment (Alamri, Watson and Watson, 2021). The expansion of blended learning in secondary education reflects a broader shift in educational paradigms towards more adaptable and student-centered approaches.

Several recent research papers have focused on the adoption of blended learning in diverse frameworks, its advantages and disadvantages, as well as blended learning assessment and layout. In general, blended learning has been found to be more effective than face-to-face or online instruction (Brodersen and Melluzzo, 2017). According to Avazmatova (2021), blended learning is preferable because it is easy to access resources, give live feedback in the classroom, flexible lessons, and there is no need for large buildings.

Blended learning offers students the opportunity to ask questions and receive immediate feedback on their misunderstandings in a face-to-face setting, as well as the flexibility to participate in online sessions at their own pace and schedule (Sari and Wahyudin, 2019). In addition, students can easily access course materials, review readings in advance, and engage in online projects to deepen their understanding of the subject matter (Sari and Oktaviani, 2021). In contrast, traditional learning often involves students entering a classroom with no prior knowledge of the subject matter, learning it during class, and reinforcing their learning through homework assignments

at home (Goedhart et al., 2019). By using blended learning, educational institutions can reduce their physical footprint and the need for large buildings to accommodate all students at the same time. This allows for a more efficient use of resources, as different groups of students can receive training either in-person or online at different times (Avazmatova, 2021).

2.6.1 Components of the blended learning model

A model is a representation of a system or phenomenon that explains its observed or inferred features and can serve as a framework for studying its properties. Consequently, a blended learning model can serve as a roadmap for assessing and combining distinct elements to create an effective learning environment (Singh, Steele and Singh, 2021).

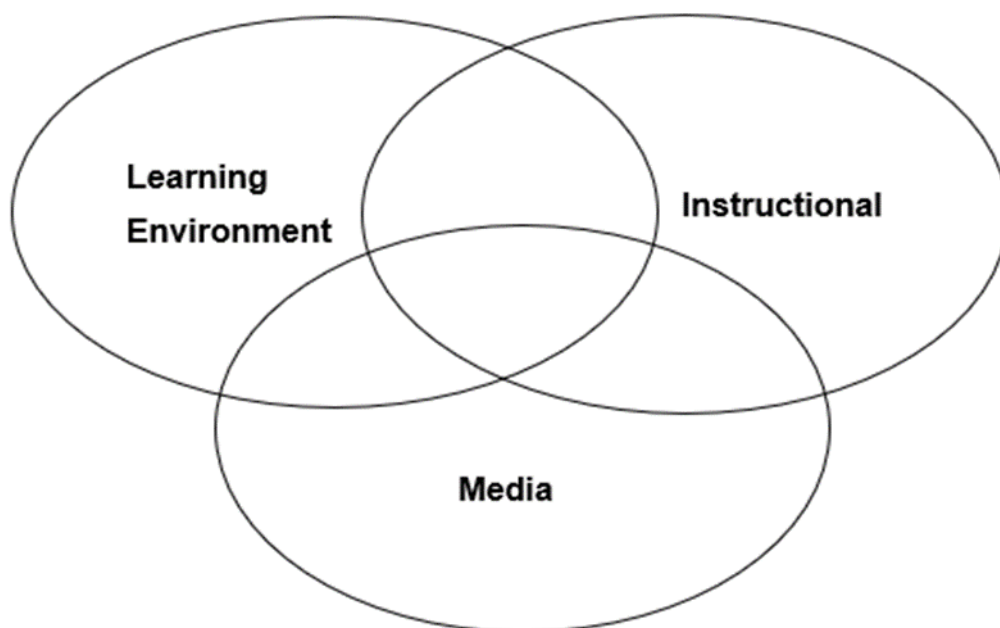


Figure 2.1: Components of the blended learning model

2.6.1.1 Media component

Media refers to channels that distribute information. In the context of learning, certain instructional media may be more suitable for either synchronous or asynchronous learning environments (Grammens et al., 2022). However, there is no inherent superiority or inferiority of any medium. While the choice of delivery medium may not

change the intended content, it can influence how the content is designed to make the most of the medium's distinct features (Holden and Westfall, 2021). Ultimately, the selection of the most appropriate media will not impact learning outcomes, as it is the instructional strategies employed that have the greatest impact.

2.6.1.2 Learning environment component

There are two types of learning environments: synchronous and asynchronous, each with its own unique advantages and disadvantages. The aim of blended learning is to take advantage of the positive aspects of each environment to effectively use resources in achieving instructional objectives and learning goals (Ulfa and Puspaningtyas, 2020).

Asynchronous e-learning refers to learning that is typically supported by communication tools such as email and discussion boards, enabling collaboration among learners and between learners and lecturers, even if they are not online simultaneously (Oktarina et al., 2021). Asynchronous e-learning is an important element of flexible e-learning. Many individuals choose to take online courses due to their asynchronous nature, which enables them to balance education with other commitments such as work and family (Ogbonna, Ibezim and Obi, 2019). Additionally, synchronous e-learning allows learners to access the e-learning platform at any time and access resources such as documents or send messages to their lecturers or peers. This type of learning environment enables students to take more time refining their contributions, resulting in more thoughtful and considered communication compared to synchronous communication (Namada, 2022).

Synchronous e-learning is facilitated by tools such as videoconferencing and chat groups and has the potential to support the creation of learning communities among e-learners. Unlike asynchronous e-learning, synchronous e-learning provides learners and lecturers with a more social experience, as they can ask and answer questions in real-time. Synchronous sessions can help e-learners feel like active participants and foster a sense of community, rather than feeling isolated as individuals communicating with a computer (Namada, 2022).

2.6.1.3 Instructional component

When designing a blended learning program, it is crucial to prioritise instructional quality to achieve the intended learning objectives. This involves selecting appropriate instructional strategies that align with the learning objectives and facilitate the transfer of knowledge. By doing so, the learning objectives can be effectively achieved without compromising instructional quality (Chaeruman, Wibawa and Syahrial, 2020).

2.6.2 Factors to consider with blended learning

Blended learning offers students the best of both worlds, providing a flexible and personalised learning experience. When designing a blended learning approach, here are some factors to consider:

- i. *Learning objectives*: The learning objectives should be clear and concise. Determine what you want your students to achieve and ensure that the blended learning approach aligns with those objectives (Moşteanu, 2021).
- ii. *Content delivery*: Decide which content is best delivered in a face-to-face environment and which can be delivered online. Some topics may require more interactive and hands-on learning, while others can be delivered through lectures, videos, or other multimedia formats (Gayed et al., 2019).
- iii. *Technology tools*: Choose appropriate technology tools to facilitate online learning, such as learning management systems, video conferencing software, or other online collaboration tools. Ensure that students have the necessary equipment and access to technology to participate fully in the online component of the course (Kumar et al., 2021).
- iv. *Assessment and feedback*: Determine how you will assess student learning and provide feedback. Online assessments can be automated, but formative assessments that provide feedback and promote learning should be included in the face-to-face component of the course (Watling and Ginsburg, 2019).

- v. *Communication and support*: Ensure that students have access to clear communication channels and support throughout the course. Establish guidelines for communication and availability and provide students with resources to help them succeed (Gayed et al., 2019).
- vi. *Flexibility*: Blended learning is meant to be flexible and adaptable to different learning styles and preferences. Allow for some degree of flexibility in the course schedule and delivery to accommodate students' needs (Abbacan-Tuguic, 2021).

Lecturers can design effective and engaging blended learning approaches that enhance student learning and success by considering these factors.

2.6.3 Challenges of blended Learning

Rasheed, Kamsin and Abdullah (2020) point out the challenges of blended learning in South Africa:

- i. Lack of comprehensive institutional and organisational structures to support e-learning development and growth.
- ii. There is no policy in place that promotes lecturers and students to use e-learning in their classrooms.
- iii. Lack of quality management processes to enhance e-learning.
- iv. There are few initiatives for staff development to integrate e-learning into existing curricula.
- v. There are no technical or system support mechanisms in place.
- vi. Lack of support from leadership for change management; and
- vii. A substantial amount of money is required to create effective e-learning programmes.

2.7 WEB-BASED LEARNING USAGES AND ACTIVITIES BY USERS

Web-based learning has become increasingly popular in recent years and users utilise it in a variety of ways for personal and professional development. Therefore, each educational institution's experience with these systems is different (Washington, 2019). However, according to Ubaedillah et al., (2021), web-based learning has rapidly become the desired or modern standard form of research worldwide. Some of the most common usages and activities listed by Bonk and Lee (2017) are:

- i. *Courses and credentials*: To gain new skills, knowledge, or certifications, many users enrol in web-based courses. A vast variety of courses on subjects ranging from coding to business management are available on well-known sites like Coursera, Udemy, and LinkedIn Learning.
- ii. *Professional growth*: Many companies provide their staff with online training opportunities, and some even demand that staff members pass specific courses before moving up the corporate ladder.
- iii. *Test preparation*: Online education is helpful for test preparation, including for standardised exams like the Scholastic Aptitude Test, Graduate Record Examinations, and Test of English as Foreign Language. Numerous websites exist that provide users with study guides, practice exams, and quizzes to aid in their preparation.
- iv. *Personal interests*: A lot of individuals use online education to pursue their personal interests such as music, cuisine, or photography. A wide variety of interests are catered for through online tutorials and courses.

According to Camacho and Legare (2021), web-based teaching and learning allows teachers and students to share resources, submit assignments, and connect and communicate online. Thus, while students can access learning resources, submit assignments, and engage in other online learning activities, the teacher can publish teaching materials and assignments to an online folder for course administration (Darby, 2019). Cardullo et al., (2021) argue that the usage of a web-based LMS

necessitates student approval of the application that teachers use in their classrooms. This approval is pivotal in ensuring the successful integration of the LMS into the learning environment. When students actively support and engage with the chosen LMS, it fosters a positive and collaborative atmosphere where digital resources, assignments, and communication tools can effectively enhance the learning experience. Student buy-in not only facilitates smooth implementation but also promotes a sense of ownership and responsibility in the online learning process, making it more likely for the LMS to meet both educational and technological objectives (Altowairiki, 2023). Existing LMS techniques and their application represent a significant educational and technological practice (Bervell and Arkorful, 2020). These activities, among others, demonstrate that LMSs allow users to recognise potential and demand more from the system, and that they have therefore become essential drivers of LMSs' ongoing development (Nailiyah, 2021). A study by Nailiyah (2021) advises that if more people utilise the system frequently and in greater numbers, it will be a success. This implies that the number of users, as a result of the system's quality, determines an IT system's success. A useful IT system will be used often if it enables users to advance their work (Tsay, Kofinas and Luo, 2018).

2.7.1 Use of LMS in some South African universities

South African HEIs have been employing LMSs since 2003 to enhance communication and the teaching and learning process (Alturise, 2020). LMSs are commonly used in universities today and have the potential to improve pedagogical outcomes if used effectively (Al-Sharhan et al., 2020). Despite this, the study concurs with Coman et al., (2020) that the extent to which these methods are utilised in higher education has received limited attention. However, according to Azlim et al., (2014), LMS features and resources can facilitate collaboration and communication between students and lecturers. Lecturers should receive support to encourage active participation from students in LMSs. Table 2.1 lists South African universities and the LMSs that they utilise.

Table 2.1: LMS that are accessible at the public universities in South Africa

University	LMS	Source
University of Cape Town	Vula	https://vula.uct.ac.za/portal
University of Fort Hare	Blackboard	https://learn.ufh.ac.za/webapps/login
University of the Free State	Blackboard	https://ufs.blackboard.com
University of Johannesburg	Blackboard	https://www.uj.ac.za/corporateservices/
University of KwaZulu Natal	Moodle	https://learn2021.ukzn.ac.za/
University of Limpopo	Blackboard	https://tmlearn.ul.ac.za/
University of Mpumalanga	Moodle	https://www.ump.ac.za/
Nelson Mandela University	Moodle	https://ltcollab.mandela.ac.za/LT-Help/i-Learn-Moodle
North West University	eFundi	http://services.nwu.ac.za/ctl/student-efundi-support
University of Pretoria	clickUP and Blackboard	https://www.up.ac.za/student-affairs/news/post_2906988-up-shows-strong-adaptability-to-online-teaching-and-learning-survey
Rhodes University	RUconnected	https://ruconnected.ru.ac.za/login/index2.php
Sefako Makgatho Health Sciences University	Blackboard	https://www.smu.ac.za/stss/blackboard
Sol Plaatje University	Moodle	https://www.spu.ac.za/index.php/elearning
University of South Africa	Sakai	https://mooc.unisa.ac.za/portal
University of Stellenbosch	SUNLearn	https://africavarsities.com/sunlearn-loginlearn.sun.ac.za
Walter Sisulu University for Technology	Moodle and Blackboard	https://www.wsu.ac.za/index.php/component https://wiseup2.wsu.ac.za/
University of Venda	Moodle	https://myuniven-moodle.univen.ac.za/

University of the Western Cape	iKamva (Sakai)	https://ikamva.uwc.ac.za/portal
University of the Witwatersrand	ulwazi (Canvas)	https://www.wits.ac.za/ulwazi/
University of Zululand	Moodle	https://learn.unizulu.ac.za/
Cape Peninsula University of Technology	Blackboard	https://myclassroom.cput.ac.za/
Central University of Technology	eThuto (Blackboard)	https://ethuto.cut.ac.za/
Durban University of Technology	Moodle	https://tlzprod.dut.ac.za/login
Mangosuthu University of Technology	Moodle and Blackboard	https://moodle.mut.ac.za/login/index.php https://www.mut.ac.za/student-portal/
Tshwane University of Technology	Blackboard and D2L Brightspace	https://mytutor.tut.ac.za/ https://mytutord2l.tut.ac.za/
Vaal University of Technology	Blackboard (VUTela)	https://blackboard.vut.ac.za/

Source: Badaru and Adu (2022).

2.8 CHALLENGES OF WEB-BASED LEARNING

While the integration of web-based learning has been a huge success, according to the research, it has also presented significant obstacles to South African HEIs (Aldowah, Al-Samarrie and Ghazal, 2019). Bagarukayo and Kalema (2015) argue that learners in South Africa experience a range of obstacles, including diverse backgrounds, languages, and ethnicities; financial inequality; infrastructural limits, access issues, a shortage of qualified lecturers, job loss misunderstandings, and teachers finding it difficult to generate curriculum. Furthermore, in large classes, teaching strategies are difficult to apply and acquiring insight into student concerns is difficult (Jacobson, Levin and Kapur, 2019).

Castro (2019) states that students, especially those from low-income families, may experience setbacks in their education. Yustina, Syafii, and Vebrianto (2020) propose that novel blended learning techniques are necessary to tackle educational barriers arising from factors such as cultural and class diversity, prior learning experiences, increased demand for education, and evolving learning expectations. Table 2.2 illustrates the different challenges faced by students and lecturers in South Africa.

Table 2.2: Challenges of web-based learning in South Africa

Author(s)	Challenges
Parveen et al., (2020)	Academic competency, diversity in school backgrounds, huge classes, multilingualism in a first language setting, poor curriculum design, and learner academic preparation.
George et al., (2022)	Inequitable access and low bandwidth.
Pete and Soko (2020)	A variety of organisational contexts, practices, and cultures; infrastructure limitations, such as the proportion of PCs to internet users, bandwidth, and internet costs; demographic differences, cell phone subscriptions; infrastructure limitations, such as the proportion of PCs to internet users, bandwidth, and internet instability in learning management systems; a lack of interactivity.
Simamora (2020)	Insufficient coordination and technological support, inadequate infrastructure and network coverage, unstable technology, time-consuming administrator processes, resistance to change, accessibility problems, institutions users with troublesome network systems, literacy barriers, and inadequate user support.
Mpungose (2020b)	Limited funding, educational inequalities, lack of access to technology, low amount rates, technical costs, infrastructure satisfaction, academic efforts,

	lack of graduate business strategy skills, underutilised systems, high-speed internet bandwidth costs, and user penetration.
Ferri, Grifoni and Guzzo (2020)	E-learning culture, technological difficulties, lecturer attitudes, cost and quality, a lack of pedagogical strategies, a lack of university policy, training, motivation, and incentive, lack of facilitating environments, logistical problems, poor management, and ICT provision are some of the factors that affect e-learning.
Ferri, Grifoni and Guzzo (2020)	A lack of money, inadequate ICT skills, and restricted access to computers and the internet

Despite these challenges, many students and lecturers have discovered that web-based teaching and learning may be a worthwhile and successful method of receiving and imparting knowledge. By addressing these challenges, the quality of online learning can be improved, and its potential fully realised.

2.9 SUMMARY

This chapter surveyed the literature on the use of technology in education, both globally and in the context of South Africa. The literature on the importance and use of technology in higher education was also reviewed, with an emphasis on the nature and breadth of web-based learning. This chapter's main objective was to present a summary of the literature on web-based teaching and learning, user activities, and challenges that teachers and students face. The chapter also examined the literature reflecting student perceptions of web-based learning and how that influences their academic achievement. The next chapter discusses the theoretical framework employed in this study.

CHAPTER 3: THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1 INTRODUCTION

The preceding chapter examined the pertinent literature in research, revealing the significance of technology in education and the possible challenges encountered in web-based teaching. In this chapter the theoretical and conceptual framework of the study is presented, with detailed explanations of the utilised models. To construct the conceptual framework as illustrated in Figure 3.1, the technology acceptance model (TAM) and the Auckland student engagement model (ASEM) were utilised, as shown in Figures 3.2 and 3.3. Additionally, the chapter explores various learning styles and theories, and the significance of recognising learning styles.

3.2 RATIONALE OF THEORETICAL AND CONCEPTUAL FRAMEWORK

A theoretical framework provides a conceptual model that explains the relationships between key variables or concepts in a research study. It is a set of interconnected concepts, ideas, and assumptions that help researchers make sense of the phenomena they are studying (Varpio et al., 2020). A theoretical framework provides a lens through which researchers can view their research problem, helping them to identify the key variables and to define the relationships among those variables (Kivunja, 2018). A conceptual framework, on the other hand, is a visual representation of the theoretical framework. It is a diagram or model that illustrates the key concepts and their relationships in a research study. The conceptual framework helps researchers to visualise how the different variables in their study are related and how they contribute to the overall research question (Lederman and Lederman, 2015).

The main rationale for developing a theoretical and conceptual framework is to provide a structured approach to research. By defining the key variables and their relationships, researchers can develop a clear and coherent research question, design appropriate research methods, and analyse their data in a systematic way (Imenda,

2014). Theoretical and conceptual frameworks also help researchers to identify gaps in the existing literature and to develop hypotheses to test in their research.

3.3 CONCEPTUAL FRAMEWORK

A conceptual framework is the current comprehension of a phenomenon or problem that identifies gaps in our knowledge and establishes the theoretical basis for the research undertaking. It aims to answer two key questions: how can these insights enhance our present understanding, and why is this study significant? (Varpio et al., 2020). A conceptual framework is utilised to justify the necessity of a particular study (Kivunja, 2018).

This study adopts a conceptual framework that is derived from the TAM, a well-established model for explaining technology acceptance behaviour among consumers, and the ASEM (Figure 3.1). This framework serves as a foundation with some incorporated components to explore attitudes towards the use of web-based learning management systems, as well as to investigate intentions when utilising these technologies.

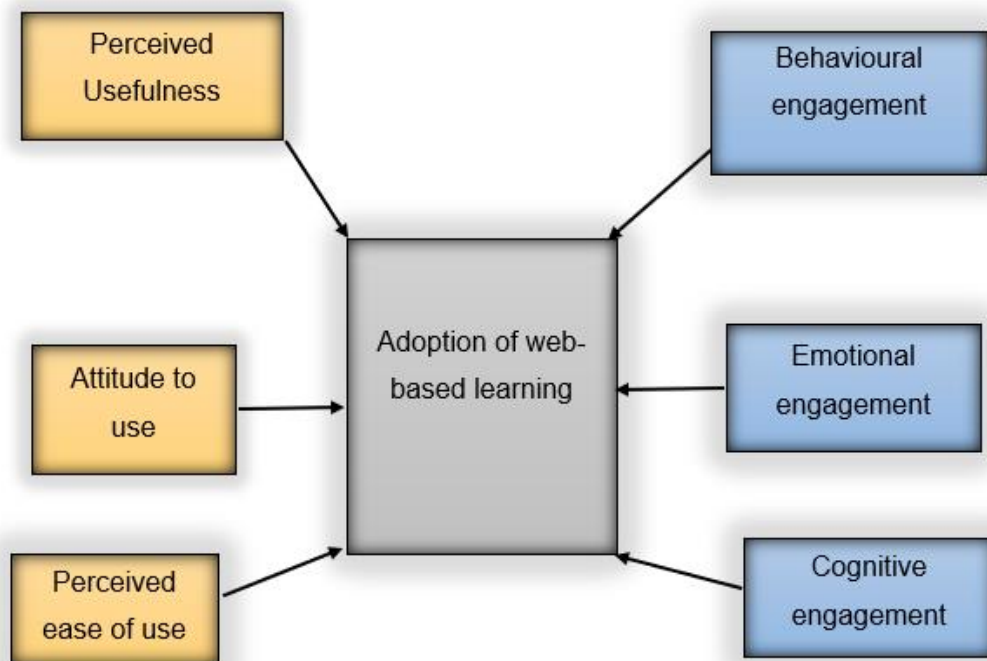


Figure 3.1: Modified from the Auckland student engagement model and TAM
Source: Davis (1986)

Figure 3.1 depicts the interrelated research concepts that serve as the key factors influencing the adoption of online learning. These factors include perceived ease of use (PEOU), attitude towards use, perceived usefulness (PU), behavioural engagement, emotional engagement, and cognitive engagement. TAM was developed by Davis (1986) based on the theory of reasoned action and was designed to analyse technology adoption and information system usage. According to Ibrahim (2018), TAM's primary constructs are perceived usefulness (PU), behavioural intention (BI), and perceived ease of use (PEOU). Chen, Shing-Han and Chien-Yi (2011) further explain that perceived usefulness refers to an individual's perception of how a particular information technology or system can improve their work or life operations. Thus, perceived ease of use is the extent to which an individual expects to find a particular information system or technology easy to use (Rosman et al., 2022).

3.3.1 Technology acceptance model

TAM asserts that a system's use is directly influenced by the variables PEOU, PU, and the individual's attitude toward system custom. Thus, TAM is a theory of information systems that forecasts how people will use a certain technology (Harryanto, Muchran and Ahmar, 2019). Abdullah, Ward and Ahmed (2016) posit that the connection between potential use of the system and its characteristics is explored regarding PEOU and PU. Khasawneh (2018) suggests that the concept of technology acceptance was created to assess how users feel about new technologies.

According to Flanders, Fishbein and Azjen (1975), the theory of reasoned action (TRA) is a social psychology theory. TRA proposes that attitudes are influenced by beliefs, which in turn affect intentions and, ultimately, behaviour (Wang et al., 2021). TRA has been incorporated into TAM via PU, PEOU, attitude, and behavioural intention, as shown in Figure 3.2. Two constructs, PU and PEOU, determine a user's final impression of a technology and predict their attitude toward it, foretelling its uptake (Scherer, Siddiq and Tondeur, 2019).

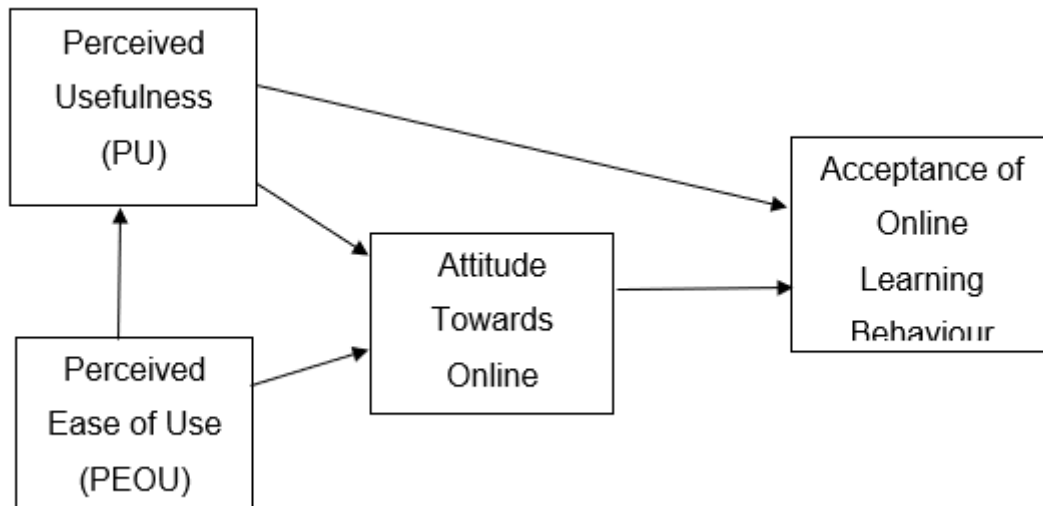


Figure 3.2: Technology acceptance model
Source: Davis (1989)

3.3.2 TAM factors

According to Davis (1989), the primary factors influencing the TAM are PU and PEOU. The extent to which someone relies on a particular system to increase their job performance is referred to as PU, whereas PEOU refers to the effort needed to use a system (Pal and Vanijja, 2020). Al-Mamary (2022) argue that PU and PEOU have an impact on a user's attitude, which determines their purpose to make use of the system. Additionally, they positively influence people's intention to utilise and adopt information systems. Perceived ease of use influences perceived usefulness, and external factors have an impact on both PEOU and PU (Rahmi, Birgoren and Aktepe, 2018).

TAM has become the premier scientific paradigm for examining how well students, teachers, and other stakeholders are embracing learning technology, and is the most frequently used theory on the research of e-learning acceptability (Granić and Marangunić, 2019; Abdullah, Ward and Ahmed, 2016; Weerasinghe and Hindagolla, 2017).

3.3.3 Strengths of TAM

TAM's strengths, according to Mathieson (1991), include the following:

- i. Cost-effective and IT-specific.
- ii. The identification of a particular comparison of behaviour is not necessary because every situation assesses the components in TAM in the same way.
- iii. Quickly and inexpensively offers general information about how users perceive a system.

3.3.4 Weaknesses of TAM

Mathieson (1991) argues that TAM emphasises the practicality and usability of variables as the key factors influencing decision-making. However, there are three issues that need to be addressed:

- i. Even though this may not be a necessary component of the model, TAM does not account for the possibility that in some circumstances, other than ease of use and usefulness, alternative factors could be used to predict intention.
- ii. The TAM does not explicitly express social factors; and
- iii. The theory of planned behaviour (TPB) and the TAM models take different approaches to behavioural control (as discussed in 3.3.1). The TPB considers the knowledge, opportunities, and resources required for behavioural control when using the system. TAM, on the other hand, considers ease of use (EOU), or the users' talents and skills required by the system. As a result, TAM overlooks several crucial control issues.

3.3.5 The Auckland student engagement model

The ASEM (Figure 3.3) proposes a framework that outlines the complex and interconnected process of engagement across three domains which are cognitive,

behavioural and emotional engagement. Cognitive engagement delves into the intellectual dimension, encompassing active participation in class, critical thinking, and a genuine enthusiasm for learning. Behavioural engagement scrutinises observable actions such as attendance, punctuality, and adherence to classroom expectations, reflecting a student's commitment to their educational journey. Emotional engagement delves into the realm of feelings and sentiments, encompassing motivation, a sense of belonging, and overall emotional well-being, as students who are emotionally engaged tend to develop strong connections with their school community and peers (Hayam-Jonas, 2016). This multifaceted model underscores the importance of addressing these three domains in tandem to foster a holistic and effective approach to student engagement within educational settings.

Engagement is often used in various contexts but has a range of meanings and interpretations (Dixson, 2015). Student engagement refers to the level of interest, motivation, and participation a student displays in their learning. It involves the extent to which a student is invested in their education, and actively involved in the learning process (Redmond et al., 2018). According to Ferrer et al., (2020), engaged students typically show a higher level of academic achievement, as they are more likely to retain and apply what they have learned. They also tend to be more satisfied with their educational experience and have a better attitude towards school and learning in general. Khlaif, Salha and Kouraichi (2021) notes that there are many factors that can influence student engagement, including the teaching style of the lecturer, the content and relevance of the curriculum, and the learning environment. However, effective teaching practices and a supportive classroom culture can help to promote student engagement and foster a love of learning (Chiu, 2022).

The focus of student-centred learning is to actively involve students in all their learning activities and prioritise the improvement of their communication and teamwork skills rather than just presenting them with information (Aguti, Walters, and Wills, 2014). Milheim (2012) proposes that using material design and standard course formatting can make it easier for students to prepare for an online classroom and enhance their overall experience. Milheim (2012) also suggests that while uniformity in an LMS with

multiple online classrooms can help students understand what to expect, it does not necessarily mean that all web-based classes should have identical materials.

For students to be successful, various factors such as their homes, universities, classmates, and communities must work together (Fredricks, Reschly, and Christenson, 2019). Engagement, as defined by Bowden, Tickle, and Naumann (2021), encompasses effort, concentration, perseverance, readiness to invest mental effort, and emotional reactions like curiosity, joy, unhappiness, dullness, and fear. Positive emotions like pleasure and happiness are associated with positive valences, while negative emotions like anger, anxiety, and frustration usually result in negative valences. The degree of polarity, activation, and intensity of student engagement valences differ. Effective engagement fosters focus, immersion, and problem solving, and is linked to student achievement (Taub et al., 2020). On the other hand, negative valences can decrease motivation and cause disengagement, avoidance, and withdrawal (Bowden, Tickle, and Naumann, 2021). As a result, De Carolis, D'Errico, Macchiarulo and Palestra, (2019) assert that good student engagement is necessary for academic success.

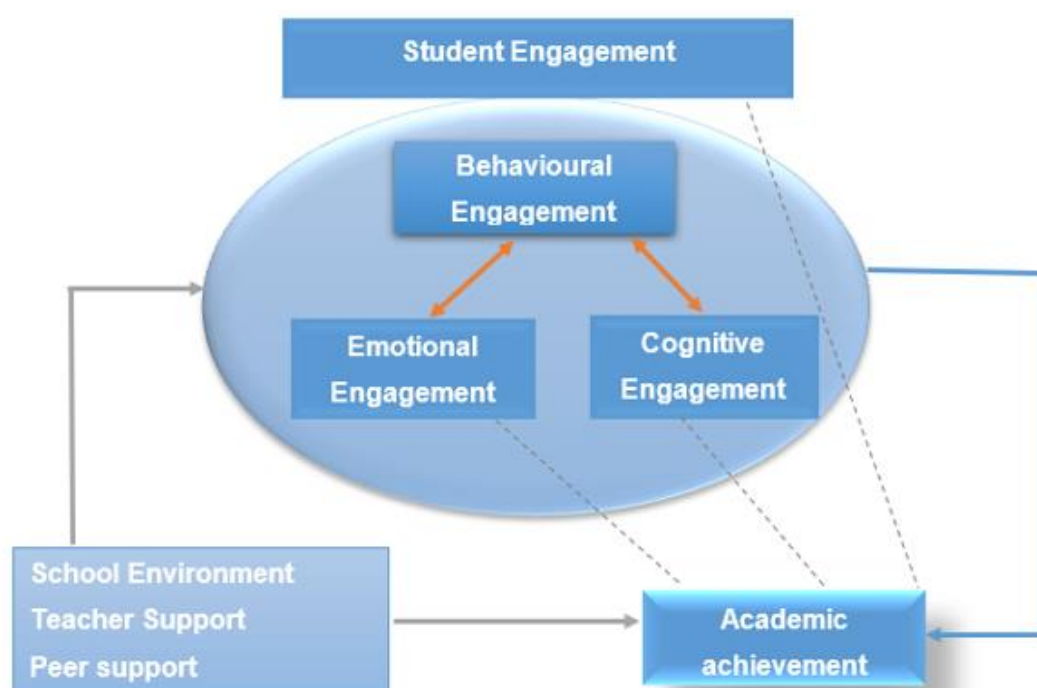


Figure 3.3: The Auckland student engagement model

Source: Hayam-Jonas (2016)

Student background, lecturer support, school environment, and peer support are the four confounding factors associated with students' engagement in the classroom. The ASEM also outlines the theory of the concurrent and vigorous process and communications across three domain of engagement and academic achievement (Hayam-Jonas, 2016).

A recent study conducted by Bowden, Tickle and Naumann (2021) proposes that student engagement can be categorised into four domains, namely behavioural, emotional, cognitive, and social. The current study focuses on exploring the aspects of behavioural, emotional, and cognitive engagement.

Behavioural engagement as the combination of observable academic performance and participation in academic activities (Dessart, Veloutsou and Morgan-Thomas, 2015). Khlaif, Salha and Kouraichi (2021) further explain that positive behavioural engagement encompasses actions that demonstrate concentration, effort, participation in classroom activities, and refraining from disruptive behaviour. Therefore, students who exhibit behavioural engagement demonstrate active involvement in extracurricular civic engagement activities and campus time (Ashkzari, Piryaee and Kamelifar, 2018). Conversely, disengagement is characterised by behaviours that indicate an unhealthy motivational state including avoiding learning tasks and being inactive (Bergdahl, 2022).

Emotional engagement refers to the extent to which students are invested in their tertiary education and is closely linked to their overall and enduring emotional experiences (Flores-Ferman, 2022). Students who are emotionally engaged experience affective responses such as curiosity, enjoyment, delight, happiness, and a sense of belonging (Wester et al., 2021). Moreover, emotionally engaged students can articulate and rationalise the significance of their social and academic connections (Strahan and Poteat, 2020). D'Errico, Paciello, and Cerniglia (2016) found that the sense of accomplishment varies based on the learning activities in web-based learning, and that behaviour engagement is positively associated with positive emotions. Conversely, emotional disengagement manifests as boredom, irritability,

anxiety, depression, and a general sense of negativity during learning activities and classes (Bowden, Tickle, and Naumann, 2021).

Cognitive engagement refers to the range of enduring and functional mental states that students experience in relation to their primary objects of engagement. It is based on a psychological commitment to learning which involves involvement, thoughtfulness, and a willingness to invest effort in comprehending complex concepts (Li and Lajoie, 2022; Blakey and Major, 2019). Students who are cognitively engaged demonstrate a deeper understanding of the value and importance of academic work through their thought processes, perspectives, beliefs, perceptions, and approaches to academic tasks (Ashkzari, Piryaee and Kamelifar, 2018; Kahu, 2013).

3.4 RELEVANT FRAMEWORKS FOR ONLINE LEARNING

Several frameworks are pertinent to this study and are discussed below.

3.4.1 Community of inquiry framework

Garrison, Anderson, and Archer (2000) created the community of inquiry (COI) model for online learning environments. This model depicts learning environments in which teachers and students are co-inquirers and discuss the problems or difficulties at hand. The COI framework seeks to clarify, define, and quantify the essentials of a cooperative and fruitful educational experience (Kaul, Aksela and Wu, 2018). Phirangee, Epp and Hewitt (2016) argue that online students' shared knowledge can foster a sense of community. Chatterjee and Correia (2020) suggest that the sensation of community boosts the availability of support, cooperation among members, the flow of information, satisfaction with group effects, and dedication to group goals. Rajkoomar (2015) states that teaching presence, cognitive presence, and social presence are the three interrelated components of the COI approach (Figure 3.4).

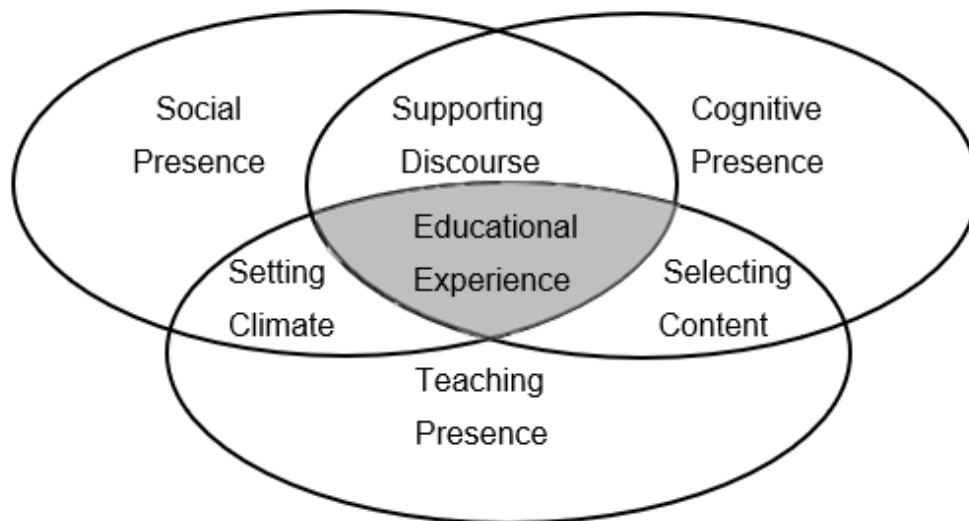


Figure 3.4: Community of inquiry

Source: Garrison, Anderson and Archer (2000)

Teaching presence involves simplifying, strategising, and managing social and cognitive processes to achieve significant and educationally valuable learning outcomes (Kaul, Aksela and Wu, 2018). Marshall and Kostka (2020) identify three indicators of teaching presence: instructional management, direct instruction, and fostering comprehension. Instructional management activities include setting a curriculum, designing procedures, defining time constraints, effectively utilising the online medium, and establishing online course etiquette (Garrison, Anderson and Archer, 2000). According to Fiock (2020), building understanding entails creating a productive collective awareness to identify areas of agreement and disagreement and achieving broad consensus and insight. Direct instruction encompasses both the effectiveness and dialogue of the educational process (Garrison, Anderson and Archer, 2000).

The **cognitive presence** aspect of COI is created by an environment that enables students to generate and strengthen meaning through ongoing reflection and discussion within a critical community of inquiry (Garrison, Anderson and Archer, 2001). The focus of cognitive presence is to facilitate group knowledge development and exploration (Galikyan and Admiraal, 2019) and encourage students to engage in critical discourse, reflect on their learning, and create meaning can aid in the development of higher-order thinking skills (Garrison and Akyol, 2009).

Social presence refers to the degree to which participants in a community of inquiry feel connected to one another and can establish and maintain interpersonal relationships. This involves the ability to communicate and express themselves in ways that demonstrate their unique identity and emotions, and to perceive and respond to others in similar ways. Social presence is important in online learning environments as it helps to create a sense of community and fosters engagement and participation among students (Garrison, Anderson and Archer, 2000). Kaul, Aksela and Wu (2018) modified the approach of understanding social presence on online learning platforms by considering the characteristics of text-based communication. This has led to the identification of three measures of social presence, namely, group cohesion, open communication, and emotional expressiveness (Tang and Hew, 2020). The three indicators have been adapted from current pedagogical philosophy to fit the context of social interactions in online environments, where communication is primarily text-based. To address problems with web-based learning in South African institutions, in the current study the various characteristics of cognitive presence, social presence, and instructional presence will be examined considering learning theories and within the creation of a framework that provides useful methods.

3.4.2 Online collaborative learning

Harasim (2012) developed the theory of online collaborative learning (OCL), derived from the theory of computer-mediated communication (CMC) also known as network learning (Picciano, 2017). Kosar (2021) suggests that the focus of OCL is on the internet facilities to deliver learning environments that stimulate cooperation and knowledge building. In addition, OCL theory is founded on and incorporates theories of cognitive development that emphasise informal learning, situations that promote deep learning, the growth of academic knowledge, and knowledge creation (Bates, 2019a). Magen-Nagar and Shonfeld (2018) observe that collaboration is useful in web-based classes because it lessens the student isolation that can result from the restricted nature of online communication with no chance for face-to-face interaction. Moreover, collaborative learning encourages student interaction and a sense of social presence in online courses (Kaban, 2021).

Kosar (2021) suggests that a key factor contributing to the success of OCL is the sense of community that students develop. However, it may take some time for students to establish this sense of community in an online environment, which can affect their level of collaboration during the course. Du, Xu and Fan (2015) also found that trust among group members can enhance their ability to work together online. Lee, Song and Hong (2019) highlight the importance of community as a factor that increases student engagement. During online collaboration and communication, students may exhibit different levels of engagement, with some participating more actively than others (Egitim, 2021). Thus, as reported by Kosar (2021), students who contribute less to group work can demotivate those who are performing well, possibly due to a lack of enthusiasm and uncertainty about working together in an online setting.

The significance of three crucial stages of discourse-based knowledge development is outlined by Harasim (2012) (Figure 3.5) as follows:

- i. *Building common ground*: In this stage, individuals engage in online discussions and work to build a shared understanding of the topic being discussed. This involves establishing a common language, clarifying concepts and terms, and exploring different perspectives.
- ii. *Phase of divergence*: Once common ground has been established, individuals in the online discussion begin to explore different ideas and perspectives related to the topic. This can involve challenging assumptions, proposing new ideas, and debating different viewpoints.
- iii. *Phase of convergence*: In this final stage, individuals work to synthesise the different ideas and perspectives that have been discussed and to arrive at a shared understanding or conclusion. This involves identifying areas of agreement, reconciling differences, and developing a coherent and shared understanding of the topic.

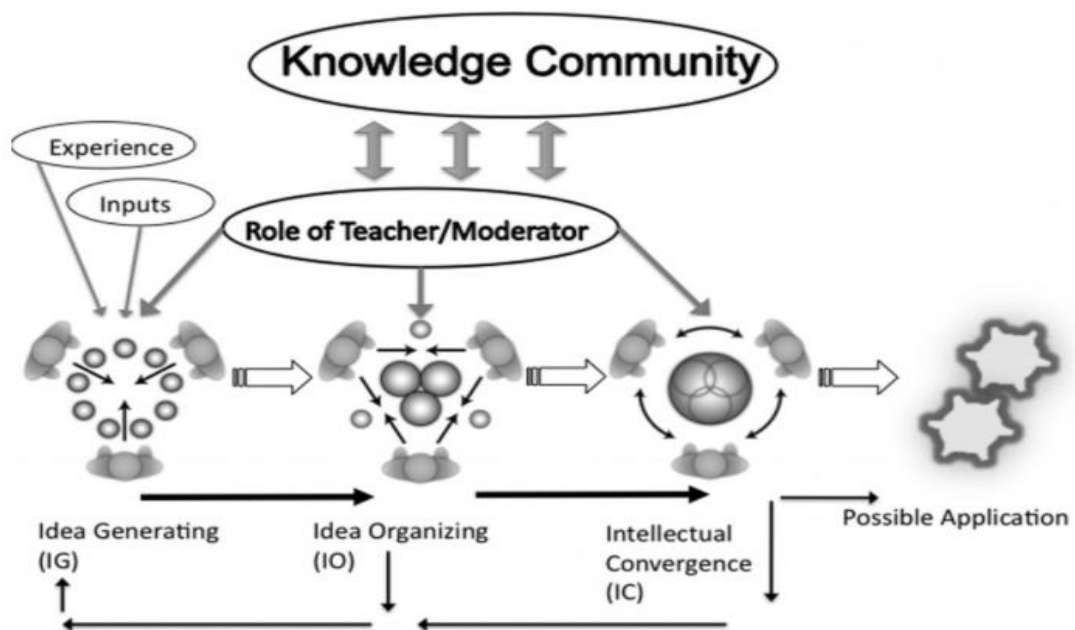


Figure 3.5: Harasim's pedagogy of group discussion

Source: Harasim (2012)

OCL operates in an environment that is asynchronous and place independent, like many other online teaching approaches (Adams and Wilson, 2020). Students are allowed to participate in class discussions on their own schedule and from any location with internet access. According to Harasim (2012), discussion forums are the central element of the teaching process under the OCL paradigm, not an addition to or complement to primary teaching resources like schoolbooks, documented lectures, or manuscript in an LMS (Bates, 2019b). This is an important design element and describes why academics and lecturers frequently lament that students do not contribute to discussions in more conventional online classes. Since online discussions do not directly affect grades or evaluations, many students see them as optional or extra work (Bates, 2019a).

3.4.2.1 Strengths and weaknesses of online collaborative learning

The OCL model has two key advantages (Chen, Jones and Xu, 2018):

- i. When used effectively, online collaborative learning can result in profound intellectual understanding or transformative learning that is comparable to, if not

better than, debate in traditional classrooms. The absence of tangible prompts and more components of face-to-face dialogue are more than compensated for by the asynchronous and recorded 'affordances' of online learning.

- ii. Online collaborative learning can assist the development of a variety of complex cognitive skills, including synthesis, assessment, and critical thinking, all of which are crucial for students in the digital era.

3.4.2.2 Weaknesses of online collaborative learning

- i. It is challenging to scale since it requires a small number of students and lecturers who are both extremely talented and certified.
- ii. While it is less likely to embrace faculty's epistemological stances in science, engineering, and computer science, it is more likely to do so in the education, social sciences, humanities, some fields of business management studies, and some fields of health. If combined with an inquiry-based approach, it might appeal to a few of these subject disciplines.

3.4.3 Khan's octagonal framework

In 2003, Badrul Khan published A Framework for E-Learning which provides educators with a tool for selecting appropriate components for adaptable learning environments. The framework, commonly referred to as Khan's octagonal framework, is named after its octagonal shape that corresponds to the eight essential features of an e-learning setting as identified by Khan (Figure 3.6). These features include educational, institutional, interface design, technological, assessment, resource support, management, and ethics. Each component of the framework outlines specific challenges that must be addressed to ensure a meaningful and effective learning experience (Singh, 2003).

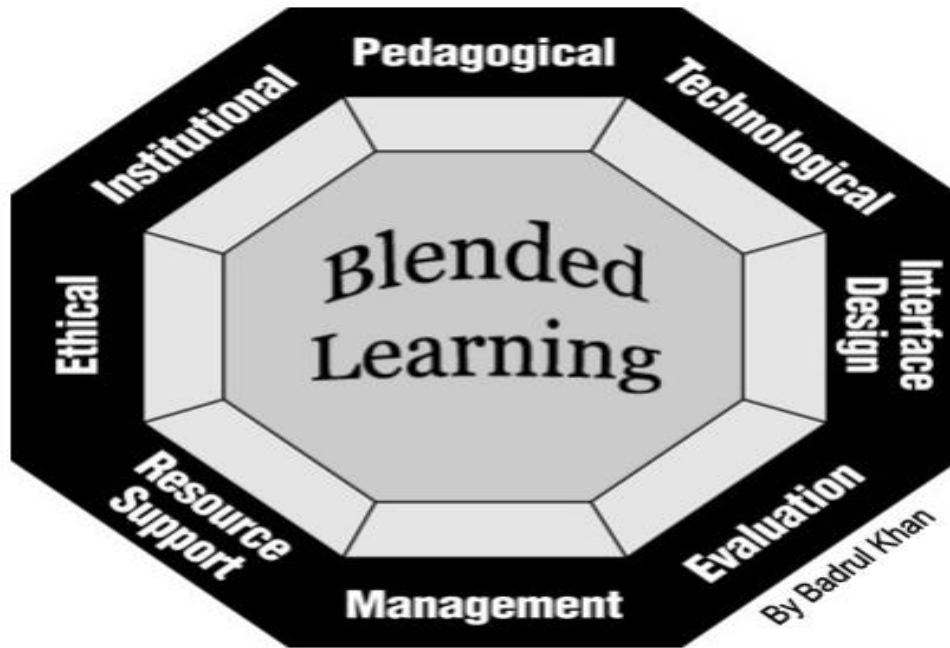


Figure 3.6: Octagonal framework of Khan (2003)

The eight components of Khan's e-learning framework are listed below, along with a brief description of each (Khan, 2003):

- The **pedagogical** element is the variety of learning materials that can be offered in both web-based and offline (face-to-face) learning settings. Additionally, it investigates the goals of the materials, the students' learning outcomes, and the learners' learning styles.
- The **technology** dimension examines the LMS's usability, accessibility, and availability to promote online learning synchrony. The system's technology component also necessitates the assistance of technical professionals.
- The **management** component addresses difficulties such as quality control, technical expert availability, infrastructure upgrades for numerous deliveries, and enhancement facilities.
- **Interface design:** This tackles difficulties with each element's user interface in the online learning environment. The interface design dimension includes

navigation, usability testing, page and site design, and content design. The user interface must support each component of the blend. It must be able to incorporate the mixture's many components, enabling students to use different delivery methods and switch between them.

- **Evaluation:** This evaluates the online learning environment's competence and efficacy, as well as the functionality and advancements of a specific LMS. According to Singh (2003), this element is focused on how usable blended learning programmes are. Programmes should be able to evaluate a learning program's effectiveness as well as the students' performance. In blended learning programmes, each delivery channel should be evaluated using an acceptable assessment approach.
- **Resource support:** This dimension looks at the assistance and resources that are needed both online and offline to create relevant learning settings. Counsellors/tutors who are available in person, over e-mail, or through chat systems are examples of resource support (synchronous communication).
- **Ethical:** The ethical factors that must be considered when developing a curriculum for online education, such as fair opportunity, nationality, and cultural diversity are listed in this component.

3.4.4 Anderson online learning model

The Anderson online learning model is a framework for designing effective online instruction, developed by Terry Anderson, a professor of Distance Education at Athabasca University in Canada. The model is based on four overlapping lenses that characterise effective learning environments:

- i. *Learner-centredness:* This lens emphasises the importance of designing online learning experiences that are tailored to the needs, interests, and preferences of individual learners. This includes providing learners with choices in terms of content, activities, and assessment methods, as well as opportunities for collaboration and interaction with peers and lecturers.

- ii. *Knowledge-centredness*: This lens focuses on the need to design online instruction that is based on sound pedagogical principles and that provides learners with a deep understanding of the subject matter. This includes the use of multimedia resources, simulations, and other interactive tools that help learners construct meaning and develop expertise.
- iii. *Assessment-centredness*: This lens emphasises the importance of designing assessments that accurately measure the intended learning outcomes and that provide learners with timely and constructive feedback. This includes the use of formative and summative assessments, as well as the use of rubrics and other grading criteria that are aligned with the learning objectives.
- iv. *Community-centredness*: This lens emphasises the importance of creating a supportive and collaborative online learning community that fosters social presence and the development of interpersonal relationships. This includes the use of discussion forums, chat rooms, and other social networking tools that allow learners to connect with each other and with lecturers in meaningful ways.

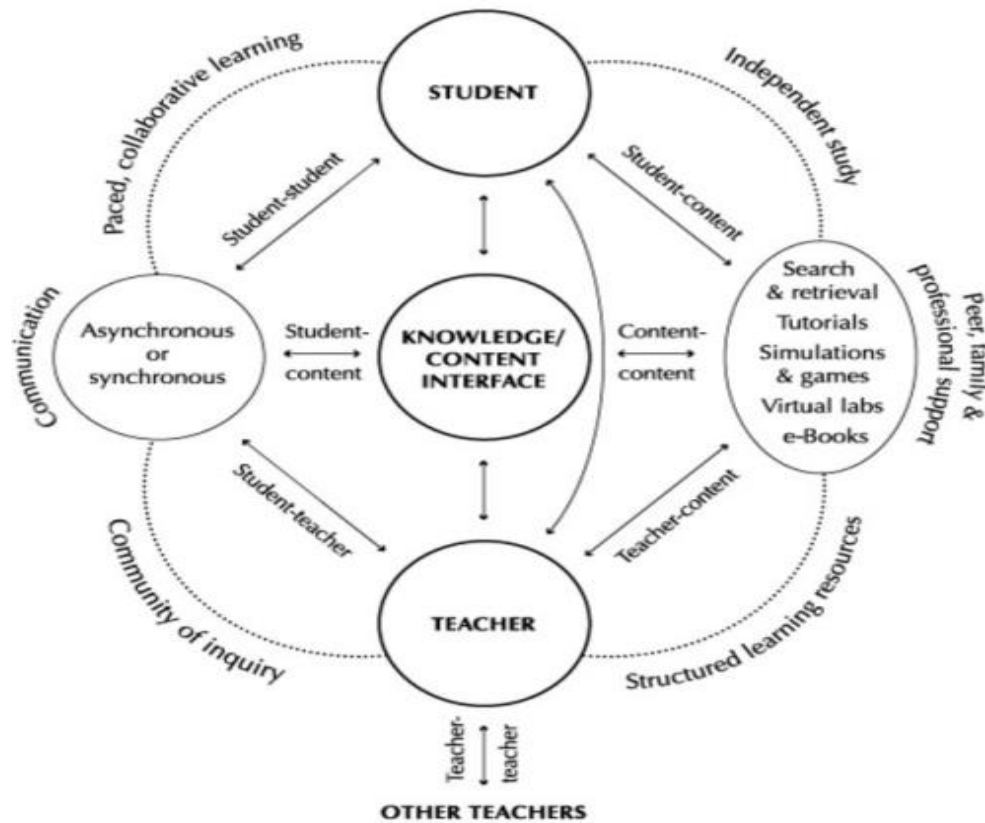


Figure 3.7: Anderson's online learning model (2011)

Figure 3.7 demonstrates that the two main human players are students and lecturers, and it is crucial to consider how they interact with each other and with the curriculum (Borba, Chiari and Almeida, 2018). Although students can engage with knowledge directly in many mediums, such as the web, many would rather have their education organised, guided, and evaluated by a teacher (Picciano, 2021). These communities are extraordinarily rich, enabling the growth of social skills, the forming of personal bonds among individuals and cooperative subject acquisition. On the other hand, the community ties learners together throughout time, necessitating frequent sessions or, at the very least, group-paced learning (Jenkins and Keefe, 2022). A study by Mangaroska and Giannakos (2018) notes that the second learning model shows the organised learning resources connected to independent learning (on the right). Computer-assisted exercises, simulations, and courses often use this medium (Anderson, 2011).

3.5 LEARNING THEORIES

Learning theories refer to frameworks that explain how information is acquired, processed, and remembered during the learning process. These theories combine various principles and models to provide a systematic explanation of the learning process (Phillips, 2014). According to Picciano (2017), understanding learning concepts is crucial for not only explaining learning phenomena but also designing effective learning environments, resources, and tasks. Learning theories can also aid in transforming learning analytics data into valuable insights for instructional design and learning, as noted by Mangaroska and Giannakos (2018).

For this study, the researcher is exploring learning philosophies that pertain to web-based learning. This exploration will enable the researcher to evaluate the instructional facilitation and design of online learning interventions. This is essential for developing a framework that can guide the creation and implementation of effective web-based learning interventions. Additionally, exploratory learning theories play a vital role in describing the learning process and will serve as a critical component of the framework for utilising web-based learning.

Merriam (2018) outlines five learning theories that provide a basis for understanding learning: humanism, cognitivism, behaviourism, constructivism, and social cognitivism. For this study, the researcher focuses on behaviourism, social constructivism, connectivism, and cognitivism as the primary learning theories. According to Taub et al., (2020), behaviourists argue that human behaviour is a result of specific environmental stimuli, an idea first introduced by Watson in the 1920s and later expanded upon by Skinner and others. Merriam and Bierema (2013) explain that if behaviour is reinforced or rewarded, it is likely to persist, but if it is not, it is likely to disappear. Conversely, cognitivism emerged as a response to behaviourism's narrow emphasis on expected stimulus and response (Carr, 2020). Cognitive theorists maintain that the mind plays a crucial role in learning, and they focus on what happens between a student's response to an external stimulus and its presentation (Harasim, 2012).

Pourfarhad et al., (2018) suggest that both cognitivism and constructivism consider learning to be a mental activity. However, constructivism goes further by linking learning to the creation of meaning from experience. Humanistic theory, as explained by Arghode, Brieger, and McLean (2017), views learning from a personal growth perspective that encompasses both emotional and cognitive aspects of learning. Additionally, Vygotsky and Cole (2018) argue that problem-solving is a fundamental part of the learning process, and that learning is founded on the social construction of solutions to problems.

3.5.1 Behaviourism theory

Behaviourism is concerned with studying human behaviour (Picciano, 2017). This perspective emerged from a positivist view that emphasises cause and effect, where actions lead to reactions (Smith, 2020). Behaviourism is mainly concerned with analysing how individuals respond to specific cues that can be measured, controlled, and evaluated when repeated (Gunnars, 2021). Silva (2018) notes that behaviourism places less emphasis on cognitive processes and more emphasis on observable behaviours. According to Rajkoomar (2015), for behaviourists, external factors in the learning environment are more critical than the individual student in shaping learning. Observable behavioural changes are an indication of learning (Ramachandran, Huang, and Scassellati, 2019). The most significant elements in behaviourism are stimulus and response (Fisher, 2011). Learning occurs through interaction with the environment. Malik (2021) explains that two crucial learning concepts in behaviourism are contiguity, which refers to how quickly events must happen to form a relationship, and reinforcement, which involves using feedback to increase the likelihood of the intended action.

Behaviourism proposes that a students' behaviour is a key indicator of whether learning has occurred (Clark, 2018). Learning involves acquiring mental schemas, information, skills, and abilities that can be used to solve problems more effectively (Griffiths, 2018). Rajkoomar's (2015) study emphasises the importance of creating behavioural objectives, carefully structuring resources through selective reinforcement, and task analysis in accordance with behaviourist principles. Moreover, individualised education is provided, with each learner responding to inquiries and

receiving instant feedback. In the context of web-based learning, it is crucial to explicitly state the intended outcomes of each assessment and provide appropriate feedback and motivation (Aljraiwi, 2019).

3.5.2 Cognitivism theory

The development of cognitivism as a learning theory dates back to the early 20th century. According to Hayes and Hofmann (2021), the shift from behaviourism to cognitivism was triggered by the inability of behaviourists to explain how and why individuals process information. In contrast, cognitivism considers learning as a core mental development process that involves critical functions such as information processing, retrieval, storage, problem-solving, thinking, concept development, and language (Çeliköz, Erisen and Sahin, 2019). Unlike behaviourism, which focuses on observable behaviour, cognitivism concentrates on complex cognitive processes. Curum and Khedo (2021) emphasise that one of the main goals of cognitivist learning theory is to communicate information effectively to students while allowing them to use the most efficient cognitive strategies to process the information. Therefore, instructional designers should consider the learners' current abilities and the learning task requirements (Rumjaun and Narod, 2020). Additionally, by conducting a cognitive task analysis, designers can assess learners' current level of cognitive abilities and determine the most effective information presentation methods (Curum and Khedo, 2021).

3.5.3 Social constructivism theory

Constructivism is a learning theory that focuses on the learner's active construction of knowledge through their experiences, interactions, and reflections (Mann and MacLeod, 2015). This perspective suggests that learning is an ongoing process that takes place in social contexts and is influenced by cultural and environmental factors (Ertmer and Newby, 2013). According to constructivism, learners are not passive recipients of information but active agents who construct their knowledge based on their previous experiences, beliefs, and interactions with the environment (Schunk, 2013).

Constructivism views learning as an individual and collaborative activity that involves constructing meaning from experiences (Vygotsky and Cole, 2018). It emphasises the importance of the learner's active participation in constructing knowledge, rather than passive receiving of information (Mann and MacLeod, 2015). This theory emphasises the role of the learner's prior knowledge and experiences and suggests that new knowledge is constructed by building upon the learner's existing knowledge (Schunk and Ertmer, 2013). In constructivism, the role of the lecturer is to facilitate the learning process by providing opportunities for learners to interact with the environment, explore new ideas, and reflect on their experiences (Ertmer and Newby, 2013). The lecturer serves as a guide and facilitator, rather than an authority figure, and encourages learners to construct their knowledge based on their experiences and interactions with the environment (Khan and Tariq, 2020).

3.5.4 Connectivism theory

Connectivism views learning as a process of connecting information sources and creating a network of knowledge that can be used to solve problems (Siemens, 2005). This theory highlights the importance of technology in enabling learners to access information from diverse sources and interact with others to construct knowledge. According to Siemens (2005), connectivism emphasises the need for learners to be self-directed and able to navigate complex and changing information landscapes. Online learning environments such as MOOCs, discussion forums, and social media platforms provide opportunities for learners to collaborate, share resources, and co-create knowledge (Siemens and Tittenberger, 2009). However, this theory has also been criticised for its lack of clarity and empirical evidence (Kop and Hill, 2008). Nonetheless, the use of technology in education continues to evolve, and new learning theories are emerging to account for these changes. According to Siemens (2005):

Connectivism holds that choices are based on rapidly shifting foundations. Continuous data collection occurs. Understanding the difference between significant and irrelevant information is essential. It's also crucial to have the capability of recognizing when new information modifies the environment as a result of choices made yesterday.

Siemens (2005) suggests that the theory of connectivism is influenced by the dynamic nature of information flow. Therefore, students must possess the skills to navigate through vast and ever-changing pools of data, and they should have access to appropriate resources for this purpose. Siemens proposed eight connectivism tenets:

- i. A variety of perspectives is the cornerstone of knowledge and comprehension.
- ii. The process of learning involves connecting specialised nodes or information sources.
- iii. Machines other than people may be able to learn.
- iv. The ability to learn is more significant than what is presently understood.
- v. Maintaining and nurturing connections are crucial to facilitate continuous learning.
- vi. The capacity to recognise links among concepts, ideas, and domains is a fundamental ability.
- vii. The goal of any connectivist learning activity is currency (up-to-date and correct knowledge).
- viii. The process of making decisions can be educational. Through the prism of a dynamic world, the relevance of incoming knowledge and the choice of what to learn are seen. While the answer might be right now, it might change tomorrow due to changes in the information environment that affected the choice.

According to connectivism, knowledge is generated when students engage with a learning community (Boyratz and Ocak, 2021). Siemens (2005) defines learning communities as groups of individuals who share common interests and engage in dialogue, discussion, and collaborative thinking. Epstein (2019) argues that such participation can foster discussions among students, teachers, and those with greater knowledge. In addition to textual communication, multimedia elements such as video and images may be incorporated into online chats (Goldie, 2018). With the rise of web 2.0, students can now create personalised learning environments (PLEs) that allow them to produce and consume learning materials (Korhonen, Ruhaalahti and Veermans, 2019). However, some scholars have criticised connectivism. For instance, Kerr (2007) has criticised Siemens' (2005) emphasis on the currency of knowledge, arguing that it overlooks the durability of certain types of information and the possibility that some

knowledge may be more valuable than others depending on the situation. Verhagen (2006) contends that connectivism is not a learning theory but rather a pedagogical approach that can inform teaching and curriculum development.

The researcher acknowledges the critiques directed towards connectivism as a learning theory. Nonetheless, the researcher finds connectivism relevant and fundamental to the current study. While established learning theories such as cognitivism, constructivism, and behaviourism offer insights into how individuals engage and function within their environments, connectivism also provides unique perspectives on learning in the digital age.

3.6 LEARNING STYLES/SENSORY PREFERENCES

The terms "learning style," "cognitive style," "sensory preference," and "personality types" have all been employed in the literature. In certain circumstances, several of these names have been employed interchangeably, while in others, they have been differentiated. There is no distinction between sensory preferences and learning styles in this research.

A learning style model is a set of learning style aspects that lecturers can use to guide their lesson planning but acknowledge that it is an incomplete representation of the complexity of learning (Chen et al., 2019). Like an engineering model, a learning style model attempts to replicate the behaviour of a complex system based on historical interpretations and established cognitive theories (Hmedna, El Mezouary, and Baz, 2020). As with any model, the usefulness of a learning style model depends on its ability to accurately depict learner behaviours in a variety of contexts (Felder, 2020). A student's preferred learning style can also be seen as a unique trait (Sener and Çokçaliskan, 2018), and while individuals may have a variety of preferences, they can adapt them to different teaching and learning situations, and lecturers can consider them when designing their instructional strategies (Kompen et al., 2019). Pritchard (2017) describes learning preferences as an individual's preferred intellectual approach to learning, which can significantly impact how they learn compared to what educators might expect in a classroom setting.

Pritchard's (2017) research argues that individuals may not always exhibit certain learning techniques and that they can adapt to various learning styles depending on the situation. Typically, people prefer one or two learning styles over others. As a result, Honey and Mumford (1986) suggest that students should be able to use at least one of four different learning styles to succeed in any given task. However, Hwang, Wang, and Lail (2021) contend that if students are unable or unwilling to adopt a particular learning style, their ability to learn effectively may be hindered.

The Honey-Mumford model is a learning style model that was developed by Peter Honey and Alan Mumford in 1986. The model categorises learners into four different types based on their preferred learning styles, which include activist, reflector, theorist, and pragmatist.

- i. **Activists** - Prefer learning by doing than learning by hearing or reading. They are open to experimenting with new things and will try anything. They like participating in a wide variety of activities and experiences, including collaborating in groups to exchange and test ideas. They are more concerned in getting things done than in planning. Activists, who are typically open-minded and eager to learn new things are annoyed by repetition.
- ii. **Reflectors** - Take a step back and examine what is going on. Before making a choice, they prefer to gather as much information as possible, and they are always willing to reconsider before taking a chance. Reflectors tend to think in terms of the big picture which encompasses past experiences along with other peoples' perspectives. Reflectors' strength comes in their meticulous data gathering and analysis, which is usually done before any judgements are reached.
- iii. **Theorists** - Students are enjoying changing and merging all of their results into frameworks in order to understand how one observation links to others. Theorists analyse and assess how new material might be compatible with their current frameworks of thought in order to assimilate new learning into current frameworks.

- iv. **Pragmatists** - Are enthusiastic about learning and applying new ideas. Pragmatists examine the potential applications of new concepts or theories before determining their utility. They think that if something works, it is fine, but if it does not, there is no use in spending time trying to figure out why. Being open to new ideas and willing to adopt them into their thinking is one of the traits of pragmatists. Pragmatists excel in circumstances requiring problem-solving.

As online learning becomes more popular, lecturers are incorporating digital materials to supplement their traditional in-person classes. However, many learning management systems take a "one-size-fits-all" approach that ignores the unique learning needs and preferences of individual students (Sangster, Stoner and Flood, 2020). It has been demonstrated that the increasing use of educational technology, particularly online tools and networks, has given lecturers more opportunities to explore learning environments that are best suited to students' instructional preferences (Alsaadat, 2018). Therefore, the focus of this study is to incorporate learning styles into online education, not by expecting a specific response to students' learning preferences, but rather by identifying students' preferred learning styles and aligning them with appropriate learning theories and objectives during the implementation, planning, and facilitation of web-based learning at DUT.

3.6.1 CURRENT CONCEPTIONS OF LEARNING STYLE

This study focuses on a limited number of learning style models that are believed to be effective in higher education online learning, despite the existence of several other models. These include the Honey and Mumford (1982), Kolb Learning Style (1984), VARK learning theory model, and Felder and Silverman (1988) models, each of which offers distinct definitions and categorisations of learning styles.

3.6.1.1 Kolb learning style

The Kolb learning style is a model of experiential learning that suggests individuals have unique learning preferences and styles. According to Kolb (1984), learning is a cyclic process that involves four distinct stages: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. According to Kolb

and Kolb (2018), these stages are connected by two main modes of processing, namely, the processing of information through reflective observation and abstract conceptualisation (called 'perception'), and the processing of information through active experimentation and concrete experience (called 'processing'). The Kolbs' approach divides learning styles into four categories: divergent, assimilators, convergers, and accommodators (Kolb and Kolb, 2018):

- **Divergent** are quite sensitive. Instead of participating, they prefer to observe and use their imagination to learn and solve difficulties. They are excellent at looking at specific situations from several angles. This technique is regarded as 'divergent' by Kolb because it allows people to perform better in settings that need idea production, such as brainstorming. Diverse learners like learning and have a variety of cultural interests.
- **Assimilators** demand a good, clear explanation as opposed to a useful opportunity. They excel at comprehending a range of information and organising it logically and clearly. They are less interested in people and more interested in thoughts and ideas. This personality type is more intrigued by theoretically sound theories than by tactics with practical significance.
- **Convergers** can find solutions to challenges and will apply what they have learned to practical problems. They are less concerned with interpersonal concerns and people than they are with technical pursuits. A convergent learning technique facilitates the development of specialised and technology skills. Convergent thinkers like trying out novel concepts, playing out scenarios, and working with practical applications.
- **Accommodators** rely on intuition rather than logic and are "hands-on". They prefer a practical, experienced approach and rely on other people's research. They are drawn to new opportunities and difficulties as well as seeing plans through to completion. People with flexible learning styles are more prone to depend on others for information than to undertake their own research. This is a typical method of public education.

3.6.1.2 Honey and Mumford learning style

Kolb's learning model served as the inspiration for Peter Honey and Alan Mumford's 1986 creation of Honey and Mumford learning styles (Bajaj and Sharma, 2018). The four different learning philosophies that students use when acquiring anything different are recognised by the Honey and Mumford learning styles model (Honey and Mumford 1986).

- **Activists** are people who prefer to learn through experience. Activists would rather get their hands dirty and take advantage of the opportunity to get in headfirst and attempt new things. They enjoy participating in brainstorming sessions with others to find creative solutions to problems.
- **Theorists** are typically students that learn by exploring the arguments for why certain things are conducted in the manner that they are. To learn properly, theorists require concepts, models, and statistics. They appreciate evaluating and understanding information to create their own theories. They highly value thinking and logic.
- **Pragmatists** learn most effectively when they can put what they are learning to use in real-world situations. They like to put new knowledge to use as quickly as they can. They look for creative ways of how to put what they've learned in class into practice.
- **Reflectors** are individuals who gain the most knowledge by observing others then contemplating what they have seen. They would rather watch than participate. Reflectors prefer to gather information from several perspectives and sources, afterwards carefully weighing it prior to making any judgements. They are circumspect and want to weigh all options before acting.

3.6.1.3 Felder and Silverman learning style

Felder and Silverman's approach was designed to be advantageous for both lecturers and learners. In addition, it helps students identify their own unique learning styles,

which can be used to enhance their studying techniques. El-Bishouty et al., (2019) note that this strategy may also assist lecturers in presenting material in a manner that resonates with the diverse learning styles of their students. The Felder and Silverman learning style has four dimensions, each with two learning styles (Felder and Silverman 1988):

- **Active and reflective students** - Applying the content, trying things out, and working actively are the greatest ways for active learners to learn. Reflective learners, on the other hand, prefer to consider and suggest the course material.
- **Sensing and intuitive students** - These types of students employ sensory experiences to learn statistics and solid learning content. Intuitive learners, on the other hand, enjoy learning about abstract concepts, such as philosophies, and their underlying values based on broad principles.
- **Visual and verbal students** - Visual students memorise what they see well, such as drawings, flowcharts, and diagrams whereas verbal students understand from written or expressed textual representations.
- **Sequential and global learners** - Sequential learners take little steps at a time and hence progress in a sequential manner. Global learners, on the other hand, think globally and holistically and learn by first grasping the big picture.

3.6.1.4 VARK learning style

The VARK learning style model was developed by Neil Fleming in the late 1980s to help students and teachers understand different learning preferences. Chaudhry, Ashar and Ahmad (2020) propose that VARK learning modalities, which include visual, aural, read/write, and kinesthetic approaches, are used to acquire information. Fleming and Mills developed this concept based on student and teacher observations (Khongpit, Sintanakul and Nomphonkrang, 2018). Visual learners comprehend information through diagrams, maps, graphs, charts, and symbols, while aural learners prefer to hear or speak information, and may benefit from group discussions, lectures, phones, radio, webchat, speaking and debating problems (Syofyan, 2018). In contrast,

read/write learners prefer text-based input and output such as manuals, reports, essays, and assignments (Mirza and Khurshid, 2020). Furthermore, kinesthetic learners prefer to learn through hands-on experience and practice, which can be achieved through simulations, demonstrations, documentaries, case studies, and films (Bajaj and Sharma, 2018; Ridwan, Sutresna and Haryeti, 2019).

A VARK questionnaire comprises thirteen multiple-choice questions, with four options for ten questions and three options for three questions, all of which correspond to the four sensory modes of VARK: visual, aural, read/write, and kinesthetic. The purpose of the survey, as described by Fleming and Baume (2006), is to initiate a conversation about students' preferred learning styles and promote metacognition. Ghavifekr and Rosdy (2015) suggest that both lecturers and students should be aware of students' learning patterns to foster a more conducive learning environment and improve instructional design in professional studies.

3.7 SIGNIFICANCE OF RECOGNISING LEARNING STYLES

According to Castro and Tumibay (2021), learning styles play a significant role in a student's life because, if they are aware of them, they may be incorporated into their learning process. Consequently, learning procedures will be more successful, quicker, and simpler (Awla, 2014). A study by Tuan (2011) adds that knowing the different learning types that students have enables teachers to design lessons that are appropriate for each one. Lizote et al., (2019) argue that especially when working with new or failing students, matching is important because they are at risk of becoming frustrated and discouraged. In contrast, mismatching may be helpful since it enables students to accommodate other people's viewpoints, consider their own learning habits, and try out alternative learning strategies (Lizote et al., 2019). However, mismatching should be handled carefully because it could result in students quitting school (Maya, Luesia and Pérez-Padilla, 2021). Finding a student's style, as described by Biggs (2001), has the added benefit of assisting pupils in problem-solving. Malik (2018) adds that the more adept students are at overcoming obstacles, the more control they will have over their own lives. Furthermore, learning how to learn is easier when an individual knows their learning style (Malik, 2018). Learners become more

independent and accountable for their own learning. The authority of teachers over students declines as learners' confidence increases (Ahmadi and Reza, 2018).

3.8 APPLICATION OF THEORY TO THE STUDY

3.8.1 The institutional dimension

In order to effectively implement an online programme, it is crucial to address the administrative affairs, academic affairs, and student services of the institution. The success of a web-based learning approach depends on the organisation's level of preparedness. These aspects rely on each other to ensure that all stakeholders involved can fully enjoy the advantages of web-based learning during its implementation and utilisation phase. Without a strong institutional foundation encompassing these three sub-dimensions, the implementation of web-based learning may fail to be recognised for its numerous benefits. The purpose of this study was to examine and comprehend the management of activities involved in web-based teaching and learning.

3.8.2 The pedagogical dimension

The researcher aimed to investigate whether the teaching and learning methods used at DUT simplify course content and enhance classroom interaction, specifically focusing on the web-based learning approach. The goal was to determine whether this method has a positive effect on learners. It is crucial to employ effective methods for delivering course content to ensure deep learning and comprehension.

3.8.3 The technological dimension

In this research study, the researcher focused on the technological dimension, which entails the requirement of costly hardware, software, and infrastructure. The primary objective was to identify the technological competencies and needs of both lecturers and students. Additionally, the study aimed to understand the participants' perceptions and attitudes towards the utilisation of technology in their current teaching and learning strategies. To achieve these goals, the researcher employed various methods such as surveys, interviews, or observations to gather data from the lecturers and learners. The

technological competencies of the participants were assessed to determine their proficiency in using technology tools and applications relevant to their field. The study also sought to uncover the specific technological needs of the participants, which include resources, training, or support required to effectively integrate technology into their teaching and learning processes. Furthermore, the research delved into the participants' perspectives on the use of technology in their current teaching and learning strategies. This aspect aimed to understand their attitudes, experiences, and perceptions regarding the benefits, challenges, and potential drawbacks associated with technology integration. The researcher explored aspects such as the perceived impact of technology on teaching effectiveness, learner engagement, access to learning resources, and overall educational outcomes.

3.8.4 The resource support dimension

To ensure a smooth data collection process, the researcher took several measures. First, the researcher ensured that the necessary staff members were available and willing to assist during the data collection phase. These staff members may have included educators. Additionally, the researcher made herself accessible to the participants by providing contact information such as email and telephone. This availability allowed participants to reach out to the researcher with any questions or concerns related to the data collected for the study. By being responsive and providing clarifications, the researcher aimed to ensure a clear understanding of the data and maintain open communication with the participants.

3.8.5 The ethical considerations of web-based learning

The researcher prioritised research ethical considerations to ensure the integrity and fairness of the data collection process. To ensure accessibility for all participants, the questionnaire and interviews were conducted online. To prevent bias during data collection, the researcher took precautions to maintain a neutral stance. This involved using standardised interview protocols or questionnaires that were designed to be impartial and unbiased. Care was taken to formulate questions and prompts in a manner that did not favour any viewpoint or influence participants' responses. These measures were implemented to gather objective and reliable data, free from any

potential biases that could compromise the integrity of the study. Moreover, the researcher ensured compliance with legal requirements pertaining to data collection and privacy. Prior to participation, informed consent was obtained from all participants, clearly explaining the purpose of the study and their rights as participants. Confidentiality and anonymity of participants' responses were strictly maintained to protect their privacy and sensitive information. The researcher also followed relevant regulations or guidelines regarding data protection and participant rights, promoting ethical conduct throughout the study.

3.9 SUMMARY

The researcher considered the TAM which was theorised by Davis (1986) and the Auckland student engagement model in creating a framework that was suitable for the utilisation of online learning. This chapter covered the important theoretical concepts that serve as the study's framework. There was also discussion of the different types of learning theories and how they applied to online learning. Furthermore, several learning styles were examined because of how they relate to instructional design and learning theories for web-based learning methods. The research methodology used in this study will be discussed in the next chapter.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

The previous chapter discussed the theoretical and conceptual framework of the study, with detailed explanations of the utilised models. The purpose of this chapter is to describe the research methodology used to accomplish the study. The research design, target population, sample size, sampling frame, and data collection approaches, including types of questionnaires, questionnaire administration, data processing methodologies, and reliability and validity issues are all discussed.

4.2 RESEARCH DESIGN

Research design encompasses the plan or strategy that connects theoretical study problems with empirical research in a comprehensive manner. This includes determining the necessary information, selecting appropriate data collection and analysis methods, and outlining how the data will be utilised to address the research questions (Flick 2014). According to Sekaran and Bougie (2014), the research design acts as a blueprint for achieving the research objectives and providing answers to the research questions. It guides the path and approach taken to accomplish the research objectives, establishing a framework for systematic and structured data collection and analysis (Pandey and Pandey 2021). A well-designed research study aligns all its elements harmoniously, promoting effectiveness and productivity (Dannels 2018). It ensures that all components of the study work together seamlessly to achieve the desired outcomes. Additionally, the research design emphasises the end-product and the activities necessary to achieve the intended results, focusing on the practical steps and processes required to obtain the desired outcomes (McChesney and Aldridge 2019).

The research design can be viewed as a functional design that integrates various research methodologies and procedures to obtain reliable and valid data for practical grounded analyses, conclusions, and potentially theory development (Yardley and Bishop, 2017). In this research study a mixed-methods approach was employed,

combining both quantitative and qualitative methods. Specifically, a sequential explanatory design was utilised, which involved collecting and analysing quantitative data first, followed by collecting and analysing qualitative data to provide further insight into the quantitative results. Interviews were conducted with academic personnel, while questionnaires were administered to students from the six faculties of the selected university. This research design was chosen for its effectiveness in addressing the research questions and converting research challenges into analysable data to address those questions. The target population for the study consisted of academic personnel and students from the six faculties at DUT. To determine the optimal sample size, a combination of simple random sampling for quantitative data and convenience sampling for qualitative data was used. The collected data was then coded and analysed using the Statistical Package for the Social Sciences (SPSS) version 28.0.

4.3 RESEARCH PHILOSOPHY

Žukauskas, Vveinhardt and Andriukaitienė (2018) provide a comprehensive description of research philosophy, highlighting its role in improving research hypotheses, expertise, and the research environment. They note that while a hypothesis may initially appear as a logical assertion, it is influenced by the researcher's expertise and perceptions, which are shaped through academic work. In a similar vein, Saunders et al., (2015) categorise research philosophy as a process that involves theories and ideas related to the development of expertise. They argue that a high-quality research study requires a careful alignment between the research design and the chosen research philosophy. Blumberg, Cooper, and Schindler (2014) caution that the research design must be robust enough to effectively support the chosen research philosophy to ensure a high level of quality in the research. They emphasise the importance of alignment between the research philosophy and the research design. Similarly, Kornberger and Mantere (2020) highlight the role of research philosophy in guiding the selection of appropriate approaches and methods. They assert that research philosophy enables researchers to explore various accessible and viable methods, aiding in the modification of suitable approaches for a given study. The most common research philosophies are positivism, interpretivism, pragmatism, and realism. These philosophies provide researchers with different

frameworks and perspectives to approach their studies, each with its own assumptions, methodologies, and implications, as follows:

- i. **Positivism** is a research philosophy that emphasises objectivity, the use of scientific methods, and the search for causal relationships between variables. Positivist researchers aim to uncover general laws or patterns that can be applied to a wider population. They rely on quantitative data collection methods, such as surveys or experiments, and statistical analysis to test hypotheses and draw conclusions (Park, Konge and Artino, 2020).
- ii. **Interpretivism** also known as constructivism or phenomenology, focuses on understanding and interpreting subjective experiences, meanings, and social phenomena. It recognises the importance of social context, individual perspectives, and multiple realities. Interpretivist researchers use qualitative methods, such as interviews, observations, and document analysis, to gain in-depth insights into the lived experiences of individuals and groups (Kumatongo and Muzata, 2021).
- iii. **Pragmatism** is a research philosophy that emphasises practicality and the use of mixed methods to address research questions. Pragmatist researchers seek to combine the strengths of both quantitative and qualitative approaches, depending on the specific research problem. They prioritise the usefulness and applicability of research findings in real-world contexts and often adopt a flexible and adaptive approach to research design and methods (Kelly and Cordeiro, 2020).
- iv. **Realism** is a research philosophy that emphasises the existence of an objective reality that can be observed and studied. It posits that there are external and independent phenomena that exist regardless of human perception or interpretation. Realism seeks to uncover the underlying structures and causal mechanisms that shape these phenomena (Žukauskas, Vveinhardt and Andriukaitienė, 2018).

These philosophies offer researchers distinct frameworks and perspectives to guide their studies, each characterised by unique assumptions, methodologies, and implications. In the case of this study, the research philosophy of pragmatism was chosen.

4.3.1 Scientific research paradigms

The scientific research hypothesis is not only a method of reasoning and conducting research but also a philosophy that guides the implementation of a research study. It provides a framework for conducting research in a specific manner. It is important to note that research paradigms encompass various elements such as ontology, epistemology, approach, and methodologies, which collectively define the nature of the research (Alghamdi and Li, 2013). Table 4.1 describes these paradigms.

Table 4.1: Three elements of systematic research paradigms

Components of paradigm	Description
Epistemology	Common characteristics and beliefs linked together with a good approach to learn about life in the physical globe.
Ontology	Generalisations made to grasp the exact nature of humanity (sequential to comprehend the real nature of the world).
Methodology	Blend of several methodologies employed by researchers to investigate various conditions.

Source: Žukauskas, Vveinhardt and Andriukaitienė (2018)

The selection of data collection and analysis methodologies, whether qualitative, quantitative, or mixed, should be driven by the research hypothesis and focus. Researchers should not limit themselves to being exclusively "quantitative, qualitative, or mixed methods researchers", but should rather choose the approach that is most appropriate for their research (Taguchi, 2018). It is possible to incorporate multiple approaches to accommodate different paradigms, rather than be restricted to a single method, which can unnecessarily simplify and limit the depth of the research effort. The scientific model considers a range of factors and offers potential explanations. While previous discussions have touched upon the theory, it is essential for researchers to delve into the foundational concepts and grasp the philosophical

significance of research problems in order to understand the various sequences of research methodologies. Table 4.2 compares the methodologies in terms of the basic paradigms.

Table 4.2: Paradigms: terminology, methods, and methods of data collection

Paradigm	Terminology	Methods	Data Collection Methods
Positivism	Objective, causal	Quantitative	Surveys, experiments, statistical analysis
Interpretivism	Subjective, meaning, context	Qualitative	Interviews, observations, focus groups, textual analysis
Pragmatism	Practical	Mixed (Quantitative and Qualitative)	Mixed methods (combination, of surveys, interviews, observations, etc.)
Realism	Social justice, power structures	Qualitative	Critical discourse analysis, participatory research, ethnography

Source: Mertens (2019) and Creswell and Poth (2016)

The primary orientation of this study aligned with the pragmatic paradigm, which emphasises the identification of problems and aims to contribute to existing and future knowledge. This approach was in line with the study's objective. The approach allowed the researcher to be flexible in her study design, choice of data collection instruments, and methodological decisions, thereby tailoring her research strategies to the specific nuances of the research question. By embracing this flexibility, the pragmatic philosophy acknowledged that different problems may require different methods and that no single approach fits all scenarios. In addition, the pragmatic research method placed a strong emphasis on practical solutions and tangible outcomes. This aligned with the pragmatic philosophy's commitment to addressing real-world issues and finding applicable solutions. Furthermore, the pragmatic perspective is marked by its acknowledgment of multiple realities. It recognises the complexity of the research

context, understanding that various factors and perspectives contribute to the overall understanding of a phenomenon.

4.4 RESEARCH METHODOLOGY

Research methodology encompasses the strategies and approaches that researchers employ to achieve their research objectives, and encompasses the formulation of research goals and questions, as well as the presentation of findings based on the collected data (Kumar, 2018). According to Hendren et al., (2022), research methodology focuses on the study plan, including the tools and procedures to be used. It encompasses the data collection approach, the sequential stages to be followed, and the objective methods to be employed. Kumar (2018) highlights three general approaches commonly used in social research to address research questions: quantitative, qualitative, and mixed methods. In this study, a mixed-method approach was adopted. Quantitative data complemented the qualitative data analysis and findings. This approach was selected to fulfil the broader objectives of enhancing and deepening understanding, as well as providing corroboration, thereby expanding the research scope beyond single-method designs. Additionally, the chosen method was deemed suitable for examining the large target population of 33 000 students and 1 500 academic staff from the DUT, ensuring the production of reliable results.

4.4.1 Mixed methods

Mixed methods research is an investigative approach that involves collecting both qualitative and quantitative data, integrating the two types of data, and employing diverse strategies (Saunders et al., 2015). Molina-Azorin (2018) emphasise that the methodological diversity of mixed methods research distinguishes it from single-method research, resulting in a broader range of perspectives. Additionally, De Goede, Bosma and Pallister-Wilkins (2019) argue that combining qualitative and quantitative approaches provides a more comprehensive understanding of the research problem compared to using either approach alone. This research design incorporates critical realist and pragmatic philosophical viewpoints.

The study's background, research questions, and findings all contribute to the methodological choices made in this design (Munyanyi, 2021). In this study, a sequential explanatory method was employed. According to Creswell and Poth (2016), sequential explanatory mixed methods begin with quantitative data collection, followed by qualitative data collection, to enhance and build upon the initial quantitative results. The researcher chose this method because, firstly, it allows for a more comprehensive and in-depth exploration of the research topic. By collecting quantitative data first and then following up with qualitative data, the researcher can build upon the initial quantitative findings and gain a deeper understanding of the phenomenon under investigation. Secondly, the sequential explanatory method enables the researcher to address any gaps or inconsistencies identified in the quantitative data through qualitative data collection. It allows for a more accurate interpretation of the research findings and helps to provide a richer and more complete picture of the research problem. Thirdly, the sequential explanatory method provides flexibility in the research process and allows the researcher to adapt and refine the research questions and methods based on the initial quantitative findings. This iterative approach enhances the overall quality and rigour of the study. Fourthly, incorporating open-ended questions in the study provided an opportunity for participants to provide additional insights that may not have been captured by the Likert scale questionnaire. Engaging directly with academic staff members enabled a deeper understanding of the research problem and provided a broader perspective.

4.4.2 Quantitative research

The quantitative approach is a research methodology that focuses on collecting and analysing numerical data to answer research questions and test hypotheses. It involves the systematic collection of data in a structured and standardised manner, often through methods such as surveys, experiments, or existing datasets. The data collected is typically in the form of numerical values or counts (Saunders et al., 2015). Quantitative research aims to quantify variables and examine their relationships using statistical analysis. It emphasises objectivity, generalisability, and the ability to draw conclusions based on statistical evidence. This approach relies on the use of statistical techniques to analyse data, including descriptive statistics, inferential statistics, and regression analysis. The researcher chose the quantitative approach for this study for

two main reasons. Firstly, the quantitative approach enables the researcher to generalise the findings to a larger population. With a large sample size and statistical analysis, the researcher can make reliable inferences about the target population, increasing the external validity of the study. Secondly, this approach provides a structured framework for data analysis, allowing for comparability and replicability of the study. The use of graphs, figures, and statistical measures makes it easier to present and communicate the findings to a wider audience.

- **Characteristics of quantitative research**

Numerous distinctive characteristics of quantitative research make it a useful method in the field of research. The first characteristic of quantitative research is its objectivity. To address research queries and evaluate theories, it seeks to collect empirical proof and quantifiable data. Statistical analysis and the use of established data gathering techniques, which reduce subjectivity and bias, are used to attain this objectivity (Mohajan, 2020). Secondly, accuracy and precision are stressed in quantitative research. To assess and interpret results, it makes use of numerical data, statistical methods, and exact measurements. Large sample sizes and probability sampling approaches improve the results' representativeness and generalisability (Scharrer and Ramasubramanian, 2021). Thirdly, quantitative research is able to establish causal connections. Researchers can determine cause-and-effect links between variables through controlled experiments and statistical analysis, revealing important details about the underpinning systems and processes at work (Munyanyi, 2021). Fourthly, quantitative research enables organised comparisons and generalisations. Researchers can draw statistically sound conclusions about the larger population by gathering data from a wide and diverse sample, allowing the findings to be applied to other contexts or settings (Mohajan, 2020). Fifthly, replication and verification are made easier by quantitative research. The study's emphasis on standardised techniques and quantifiable data enables other researchers to reproduce it, confirm the results, and add to the body of knowledge in the field. Sixthly, a high level of validity and dependability is frequently connected with quantitative research. Validity is the precision and suitability of the inferences and conclusions made from the data, whereas reliability is the consistency and stability of the measures. Statistical analysis,

rigorous measurement, and meticulous study design all help to guarantee the validity and trustworthiness of the research findings.

- **Quantitative research strategy**

Experimental and survey research methods are associated with quantitative research. Questionnaires or surveys are developed to collect data, ensuring their validity and reliability through pilot tests (Saunders et al., 2015). Data collection is then conducted, following standardised procedures. The collected data is cleaned, checking for missing values or outliers, and organised for analysis. Statistical techniques, including descriptive and inferential statistics are applied to analyse the data. The findings are interpreted and presented using visualisations such as tables, charts, or graphs. Conclusions are drawn based on the analysis, and recommendations are made, considering the limitations of the study. The research strategy aims to provide objective and measurable insights that can contribute to the existing body of knowledge and guide future research in the field (Phakiti, 2015).

4.4.3 Qualitative research

Qualitative research is a research strategy that focuses on understanding and interpreting the experiences, meanings, and perspectives of individuals or groups. It aims to explore complex phenomena and generate in-depth, rich descriptions rather than relying only on numerical data (Creswell and Poth, 2016). In qualitative research, the researcher typically collects data through methods such as interviews, observations, focus groups, or analysis of documents and texts. The research design is often flexible and iterative, allowing for an emergent and interactive process of data collection and analysis (Natow, 2020). Researchers actively engage with participants, seeking to understand their lived experiences, beliefs, values, and social contexts. Data analysis involves identifying themes, patterns, and connections within the collected data, often through techniques such as coding and thematic analysis (Kiger and Varpio, 2020). The findings of qualitative research provide a deep understanding of the research topic and offer insights into the complexity and diversity of human experiences. They can contribute to theory development, inform policy and practice, and provide a foundation for further research (Doyle et al., 2020). However, it is

important to note that qualitative research does not aim for generalisability to a larger population but focuses on understanding specific contexts and generating rich, contextualised knowledge (Hays and McKibben, 2021).

- **Characteristics of qualitative research**

Qualitative research is characterised by its focus on gaining a deep and nuanced understanding of the research topic, emphasising the exploration of individuals' perspectives, experiences, and meanings, aiming to capture the richness and complexity of human phenomena (Lichtman, 2013). Unlike quantitative research, qualitative research adopts a contextual and holistic approach, recognising the significance of social, cultural, and environmental factors in shaping individuals' behaviours and beliefs (Ormston et al., 2014). The research design is flexible and iterative, allowing researchers to adapt their methods and approaches throughout the research process based on emerging insights. Data collection in qualitative research involves diverse methods such as interviews, observations, and analysis of documents, enabling researchers to gather in-depth data from multiple perspectives (Tomaszewski, Zarestky and Gonzalez, 2020). Researchers actively engage in the research process, acknowledging their subjectivity and interpreting data to uncover patterns, themes, and relationships. Qualitative research often employs an emergent design and iterative analysis, allowing for the discovery of new insights and the refinement of research questions (Lemon and Hayes, 2020). The findings of qualitative research provide rich descriptions and interpretations, contributing to theory development and offering practical implications for various fields (Alsharari and Al-Shboul, 2019).

- **Qualitative research strategy**

A qualitative research strategy involves a systematic and iterative process of data collection and analysis to generate rich, contextually situated knowledge. The strategy begins by clearly defining the research problem or objective and formulating research questions that delve into the subjective experiences and perspectives of participants (Wutich et al., 2021). Researchers select appropriate qualitative methods (such as interviews, observations, focus groups, or document analysis) to collect data. These

methods enable researchers to gather in-depth and detailed information, allowing participants to express their views, beliefs, and lived experiences (Tomaszewski, Zarestky and Gonzalez, 2020). Data collection is often conducted in natural settings to capture the social and cultural contexts influencing participants. Throughout the research process, researchers engage in reflexive practices, acknowledging their own biases and subjectivity and considering their influence on the interpretation of data.

Data analysis involves iterative processes such as coding, categorisation, and thematic analysis to identify patterns, themes, and connections within the collected data. Interpretation of findings involves making sense of the data, developing coherent narratives, and generating rich descriptions and explanations (Lester, Cho and Lochmiller, 2020). The results of qualitative research contribute to a deeper understanding of human phenomena, provide insights into social processes, and inform theory development, policy-making, or practical applications in various fields. Qualitative research values the depth, complexity, and diversity of human experiences, emphasising the importance of context, individual perspectives, and the social construction of meaning (Maxwell, 2020).

4.5 TARGET POPULATION

The target population in research refers to the specific group or population that the researcher intends to study and apply the findings to. It represents the larger group from which the research sample is derived. Defining the target population is based on the research objectives and relevant characteristics of interest. According to Marwat, Zia-ul-Islam, and Khattak (2016), the target population is the group to which researchers want to generalise their findings. Bloomfield and Fisher (2019) define target population as individuals or topics that researchers aim to generalise their results to. This population typically exhibits diverse qualities and is often referred to as the hypothetical population. Sekaran and Bougie (2016) emphasise the importance of precisely defining the study population to ensure a representative sample size that allows for generalisability. Similarly, Kumar (2018) asserts that identifying the population is critical to a research project as it enables researchers to investigate relevant social phenomena specific to that group, which are considered problems or challenges.

The population of this study consisted of approximately 33 000 students and 1 500 academics from the DUT. Six faculties were enclosed to guarantee that the findings are a true representation of the entire institution. The Management Information Systems department at DUT was reached out to for population data.

4.6 SAMPLING

Sampling refers to the process of selecting a suitable number of elements from a population to ensure that the sample is representative and allows for the understanding and generalisation of its characteristics to the larger population (Sakaran and Bougie, 2016). The goal of sampling is to ensure that the selected sample is representative of the population of interest, allowing researchers to make valid inferences and generalise their findings (Lohr, 2021). There are two main types of sampling methods: probability sampling and non-probability sampling. Probability sampling techniques involve random selection, where each member of the population has a known and equal chance of being included in the sample. This enables researchers to calculate statistical measures and confidently generalise their findings to the larger population. Probability sampling methods include simple random sampling, stratified sampling, cluster sampling, and systematic sampling (Al Ghayab et al., 2016). In contrast, non-probability sampling methods do not involve random selection and do not provide the same level of generalizability. Non-probability sampling relies on a researcher's judgement to select individuals or elements that are suitable (convenient) for the purpose of the study. While non-probability sampling may limit generalisability, it can be useful for exploratory research, for studying hard-to-reach populations, or when resource constraints exist (Stehman and Overton, 2020). The selection of an appropriate sampling method depends on the research objectives, population size, available resources, and the desired level of precision (Lohr, 2020). Table 4.3 compares these two sampling methods.

Table 4.3: A comparison between non-probability sampling and probability sampling methods, highlighting the distinguishing characteristics of each approach

Comparison	Probability sampling	Non-probability sampling
Definition	Every representative of a population has an equivalent chance of being selected as a participant when using probability sampling.	A non-probability sample is purposefully selected because of the researcher's assessment that these individuals have specialised knowledge of the topic under consideration.
Also identified as	Random selection	Non-random selection
Foundation of variety	Random	Random
Chance of variety	Fixed and known	Not identified and unknown
Research	Decisive	Investigative
Outcome	Neutral	Biased
Approach	Impartial	Particular
Conclusions	Numerical	Systematic
Theory	Examined	Created

Source: Munyanyi (2021)

In this study, the researcher adopted a mixed methods probability sampling approach, utilising both convenience and simple random probability sampling techniques. This approach allows the researcher to select research participants in a time-efficient manner (Etikan and Bala, 2017). Furthermore, mixed methods sampling aims to create a sample that can effectively address the research questions and yield generalisable insights to other settings or populations.

To ensure a representative sample, the researcher employed probability sampling for the student sub-group, taking into account financial and data analytic constraints. A simple random probability method was utilised to select students from the total university population of approximately 33 000. The Survey Monkey sample calculator was then employed, resulting in a representative sample size of 379 students with a 95% confidence level and a 3.5% margin of error (Angioha et al., 2020). This involved using student numbers to select participants from the student population.

Simultaneously, the total academic staff population, consisting of approximately 1 500 lecturers, prompted the use of a convenience sampling method during COVID-19. This method, chosen for its emphasis on accessibility and ease of recruitment, facilitated the acquisition of 10 interviews with lecturers. Convenience sampling involved selecting participants who were readily available and willing to participate, such as those who responded to recruitment emails or expressed interest in participating through other means such as telephone calls. The adoption of convenience sampling was instrumental in navigating pandemic-related challenges, ensuring a practical and efficient approach to data collection. The associated benefits encompassed rapid participant recruitment, diminished logistical complexities, and heightened feasibility for remote or virtual data gathering. Additionally, this method allowed for a timely and cost-effective research process, enabling the researcher to adapt to the unique circumstances presented by the global health crisis while maintaining the study's integrity.

Mweshi and Sakyi (2020) argue that convenience sampling, although involving a smaller number of deliberately selected participants, leads to higher complexity of data. In this study, the researcher utilised in-depth interviews with academic staff as a qualitative method to enhance the depth of the study. This approach enabled a thorough exploration of the participants' perspectives and experiences. Additionally, a quantitative method involving a sample of students was employed to broaden the scope of the study and facilitate generalisations using a mixed methods approach. By combining both qualitative and quantitative data, the study aimed to achieve a comprehensive understanding of the research topic, capturing both the depth and breadth of the phenomenon under investigation. Table 4.4 compares convenience sampling with random probability sampling methods.

Table 4.4: Comparisons between the methods of convenience and random probability sampling

Dimensions of contrast	Convenience sampling	Simple random sampling
Other names	Convenience sampling Non-probability sampling Qualitative sampling	Research sampling Random selection Statistical sampling

Intention for sampling	Intended to create a sample that focuses on the research questions.	Intended to create a sample that focuses on the research questions.
Issues of generalisability	Occasionally pursues a type of generalisability.	Pursues a method of generalisability.
Justification for choosing cases	To describe precise goals associated with the study questions. The researcher chooses cases/units he/she has the most to learn from.	Representativeness. The researcher chooses units that are collaboratively representatives of the study.
Sample size	Usually small (normally 30 or less cases).	Sufficient in size to be representative (normally 50 cases and more).
Depth of data per case	Emphasis on the depth and complexity of data.	Emphasis on a wide range of data.
Sample selection	Either before the study, during the study, or both	Prior to the launch of the study.
How choices are made	Employs expert opinion.	Frequently centred on mathematical methods.
Sample frame	Sampling frame that is slightly bigger compared to the sample.	Much larger than the sample.
Form of information collected	Focus on narrative information. Additionally, numerical data can be gathered.	Focus on numerical data. Additionally, narrative data can be gathered.

Source: Etikan and Bala (2017)

4.6.1 Sampling Frame

A sampling frame represents the actual instances or units from which a sample is selected (Schreier, 2018). Sekaran and Bougie (2016) define a sampling frame as a representation of the entire population from which the sample is drawn. In this study, the sampling frame consisted of two distinct groups: the academic staff members of DUT, and the students. The decision to include academic staff members in extensive interviews was based on their expertise and their role in the study's subject matter. On the other hand, the selection of students was influenced by the literature reviewed in Chapter 3 which highlighted their significance as primary users of web-based platforms. Given their pivotal role, it was important to understand their perspectives.

4.7 DATA COLLECTION INSTRUMENTS

Data collection instruments are the tools or techniques used to gather data in a research study. These instruments are designed to collect information from participants in a structured and standardised manner, ensuring consistency and reliability of the data (Biesbroek et al., 2018). Common data collection instruments include surveys, questionnaires, interviews, and observation protocols. Surveys and questionnaires consist of a set of predetermined questions that participants respond to either in writing or through online platforms (Sileyew, 2019).

To meet the objectives of the study, the researcher utilised primary and secondary data. According to Taherdoost (2019), primary data refers to original data collected firsthand for the specific research study, using methods such as surveys, interviews, observations, or experiments. Secondary data refers to pre-existing data that was previously collected by someone else or for a different purpose. This data is accessible to researchers through sources such as government reports, academic publications, databases, or organisational records (Diviák, 2022). In order to gather primary data, the researcher employed questionnaires and semi-structured interviews. These methods allowed for direct collection of original data from the participants. In contrast, secondary data was collected by referring to relevant literary sources and university documents. These existing sources of data provided valuable information that supported the research objectives. By utilising a combination of primary and secondary data, the researcher was able to gather comprehensive and diverse information for the study. The primary data collection methods allowed for specific and tailored insights from the participants, while the secondary data sources provided a broader context and additional supporting information.

4.7.1 Data collection tool design

When conducting a study on web-based learning, it is important to gather perspectives from both students and lecturers (Lobe, Morgan and Hoffman, 2020). Chapter 2 of this study highlighted the crucial role of students and academic staff in providing insights. Therefore, the researcher developed specific data collection instruments to capture the necessary information. For students, a questionnaire was designed to gather their

perspectives on web-based learning. This allowed for a standardised approach in collecting data from a larger number of students.

In addition to the questionnaire, online interviews were conducted with the lecturers to obtain their insights and experiences. To ensure consistency and structure in the interviews, the researcher created interview guides. These guides served as a framework for the interviews, providing a set of predetermined questions and topics to guide the conversation with the lecturers. By employing a combination of questionnaires for students and recorded online interviews with lecturers, the researcher was able to gather diverse perspectives on web-based learning. The questionnaire provided quantitative data that could be analysed statistically, enabling the researcher to quantify trends and attitudes among the student population. Meanwhile, the interviews with lecturers offered qualitative insights and an in-depth understanding of their experiences, challenges, and strategies in delivering online education. Through open-ended questions and interactive dialogue, the interviews provided rich, contextually rich information that complemented the quantitative data obtained from the questionnaires. This multi-method approach allowed for a comprehensive exploration of the phenomenon under study, capturing both the breadth and depth of perspectives on web-based teaching and learning during the COVID-19 pandemic. By triangulating findings from both methods, the study enhanced the validity and reliability of its conclusions, providing a holistic understanding of the complexities inherent in online education delivery.

4.7.1.1 Questionnaire: a brief perspective

A questionnaire is a valuable tool used in research to collect data from individuals or groups. It consists of a structured set of questions designed to gather specific information on the research topic. When creating a questionnaire, it is crucial to define the research objectives clearly and identify the precise data needed (Brace, 2014). Multiple-choice, Likert scale, rating scales, and demographic questions are commonly used. Each question type has its own advantages and limitations, so it is important to choose them wisely based on the research objectives (Story and Tait, 2019). Furthermore, it is recommended to keep the questionnaire concise and focused, avoiding unnecessary or redundant questions to ensure participants do not feel

overwhelmed or disengaged. A well-designed questionnaire is an effective way of gathering data (Bloomfield and Fisher, 2019).

The researcher adhered to appropriate guidelines for questionnaire design, as outlined by Nemoto and Barglar (2014). These guidelines include measuring one concept at a time, using plain and simple language, employing non-technical vocabulary, and ensuring the questions are unambiguous. These principles align with general writing principles. The main quantitative tool was a five-point Likert scale. This decision was driven by the ease of collecting information from a larger number of participants, the provision of reliable estimates of person-ability, the ability to test the instrument's reliability through statistical tests, and the usefulness of the data provided by questionnaires.

In the Likert scale, the questions can be either open-ended or closed-ended. Nemoto and Barglar (2014) explain that a Likert scale allows participants to express their thoughts and feelings about a subject matter by choosing from a range of categories. While closed-ended questions offer a predefined set of response options, open-ended questions allow respondents to provide unrestricted, personalised answers, fostering a more nuanced exploration of their perspectives. The researcher opted for this method because one significant advantage of using a five-point Likert scale is the ease of evaluating and comparing the obtained data. The inclusion of both open-ended and closed-ended questions was essential for this study.

4.7.2 Student questionnaire design

The information gathered from the literature review in Chapter 2 served as the basis for the student questionnaire. The research questionnaire was categorised into three sections. Section A obtained data on demographics/background, while section B obtained strategic information on the activities involved with web-based learning via closed questions. Section C was open-ended questions which allowed respondents to respond freely to the inquiry in response to questions regarding the study's hypotheses and objectives.

A survey of the relevant literature, specifically on attitudes toward web-based learning, commitment to the use of e-learning platform, support, and use of ICT resources by students, impact of e-learning and the level of satisfaction was employed to generate the questionnaire. It was generated to facilitate the collection of relevant data and both internal and external environments were considered. The fundamental purpose of this section was to understand and critically evaluate significant challenges associated with web-based learning and how students and lecturers contribute and support each other when using e-learning platforms.

4.7.3 Semi-structured interviews

Semi-structured interviews are widely used in research to gather qualitative data and gain in-depth insights from participants. These interviews involve a flexible and conversational approach, where the researcher follows a general interview guide which allows for exploration of specific topics in more detail (Winwood, 2019). Unlike structured interviews with fixed questions, semi-structured interviews provide the opportunity for participants to elaborate on their thoughts, experiences, and perspectives (Ahlin, 2019). In a semi-structured interview, the researcher typically prepares a set of open-ended questions or prompts to guide the discussion. These questions serve as a framework to ensure consistency across interviews and cover the key areas of interest. The interviewer has the flexibility to adapt and ask follow-up questions based on the participant's responses, allowing for a deeper understanding of their unique experiences and perspectives (Stuckey, 2013).

In this study, the choice of using semi-structured interviews was driven by several factors. Firstly, semi-structured interviews were deemed suitable because they enable the collection of rich and detailed data. Participants are given the freedom to express themselves in their own words, allowing for a more comprehensive understanding of the research topic. The open-ended nature of the questions encourages participants to provide nuanced and context-specific information, which can unveil deeper insights. Secondly, semi-structured interviews were chosen to foster a sense of connection between the interviewer and the participants. The flexible and conversational approach of semi-structured interviews helps create a comfortable and trusting environment.

This atmosphere promotes open and authentic responses from participants, as they feel more at ease in sharing their experiences and perspectives.

By utilising semi-structured interviews, the researcher gained in-depth insights and captured the complexities of participants' thoughts and experiences. The method provides the flexibility to explore specific topics of interest while allowing participants to shape the direction of the interview.

4.7.4 Interview guide schedule

In this study, an interview schedule was developed and followed while conducting interviews with academic staff. The schedule provided a structured framework for the interviews, ensuring that specific topics and questions were addressed consistently across participants. Additionally, each interview allowed for a designated time at the end to gather any additional comments or insights from the participants.

The interview schedule was developed specifically aligned with the research goals and objectives. The schedule comprised ten questions that aimed to explore various aspects related to the impact of web-based learning on lecturers.

An email inviting participation was sent to all academic staff in order to recruit participants. Due to the COVID-19 pandemic and safety concerns, all interviews were conducted using MS Teams, ensuring the well-being of all participants. The researcher sought approval from the relevant ethics committee, providing a letter from the research ethics committee (FREC) along with the interview schedule. This ensured that ethical guidelines were followed throughout the study. After receiving approval, the researcher and the respondents discussed and finalised the dates and times for the interviews, allowing the participants adequate time to prepare.

The interviews were conducted over a four-week period, starting from 1 June 2022. During the interviews, the researcher requested consent from the participants to record the conversations. This recording was proposed to assist the researcher in maintaining focus and accurately capturing the information shared during the interviews. The interview questions focused on various aspects, such as the participants' experience

of teaching online, challenges encountered during online classes, support provided by lecturers to students in web-based teaching and learning, and the overall impact of web-based learning on lecturers. These topics were chosen to gain insights into the specific areas related to web-based learning and its effects on lecturers.

The researcher employed an interview schedule and implemented a systematic approach to obtain extensive and profound insights from the participants, providing valuable perspectives on the experiences of academic staff regarding web-based learning. The formulation of the interview questions was carried out thoroughly to guarantee clarity and prevent any ambiguity. Special attention was given to avoiding sensitive or inflammatory language, maintaining a tone that remained neutral and respectful throughout the interviews. Additionally, the questions were crafted in English, the primary language of the university, to promote clear communication between the interviewer and the respondents. This language choice aimed to facilitate mutual understanding and enable all participants to actively engage in the interview process effectively.

4.8 DISSEMINATION OF INSTRUMENTS

Dissemination of research instruments refers to the process of sharing and distributing the tools used to collect data in a research study. It is an essential step in research methodology as it allows other researchers and interested parties to access and utilise the same instruments for their own studies or to validate the findings of the original research. For this study, multiple methods were employed to conduct the research and gather data. The following section outlines the specific methods utilised in this investigation.

4.8.1 Recruitment process of lecturers

After obtaining ethical clearance and approval from the Accounting and Informatics Faculty Research Committee (FRC), the researcher approached a total of 15 lecturers from six faculties. These lecturers were selected as potential participants for the study. However, it is important to note that only ten lecturers ultimately agreed to participate in the research. To initiate the research process, the researcher contacted the lecturers

individually to seek their consent for participation in the study. This involved reaching out to each lecturer and requesting their permission to be involved in the research. However, the researcher encountered challenges during this stage. The lecturers had different protocols and requirements for granting approval, which complicated and prolonged the process. Some lecturers mentioned ongoing test preparations and the need to finalise students' marks, while others indicated that they would be on leave during the research period and therefore unable to participate.

Despite the difficulties faced in obtaining consent from all lecturers, ten of them eventually agreed to take part in the study. These participants constituted the sample for data collection and analysis in the research. By detailing the methods used to approach and gain consent from lecturers, this study aimed to provide transparency and context regarding the challenges and limitations encountered during the participant selection process. The researcher made concerted efforts to secure a representative sample, considering the diverse faculty backgrounds within the university.

4.8.2 Recruitment process of students

Administering a questionnaire study is a critical aspect that can greatly impact its success or failure. Poorly executed administration procedures can lead to various issues that undermine the reliability and validity of the collected data. One common concern in administering a questionnaire study is the lack of standardised procedures (Dewaele, 2018). Procedures used to administer the questionnaire, including instructions provided to participants, the clarity of questions, and the overall survey administration, can significantly impact the quality and reliability of the data collected (Brace, 2018). Therefore, it is essential to establish clear guidelines for the administration process to ensure consistency across participants. Inconsistencies in how the questionnaire is administered can introduce bias and affect the comparability of responses.

One of the most efficient ways to disseminate questionnaires is through hand distribution to the intended participants. This method ensures direct contact and can potentially yield higher response rates. However, other factors, such as time

constraints and feasibility are relevant when selecting the most appropriate dissemination method (Brace, 2018).

In response to the COVID-19 pandemic and to ensure the safety of all participants, the researcher opted to collect data electronically rather than through traditional methods. An email containing a hyperlink to the online questionnaire was sent to all students, allowing them to access and complete the questionnaire remotely. This approach aligns with the rules and regulations imposed during the pandemic to minimise physical contact and maintain social distancing measures. However, it is important to note that this method presented its own set of challenges. Contacting and reaching out to participants proved to be difficult, and some respondents took a considerable amount of time to complete the questionnaire. The researcher made multiple requests and sent reminders to participants to encourage timely completion. Despite these efforts, delays in response and completion were encountered.

To account for potential difficulties faced by respondents, the initial timeframe allocated for the questionnaire dissemination was set at five months. This duration was intended to allow participants ample time to respond, considering potential issues such as data and connectivity problems that may arise when collecting data online. The decision to collect data electronically was made to prioritise the safety and well-being of the participants, adhering to COVID-19 regulations. While it presented challenges in terms of participant engagement and response time, the extended timeframe aimed to accommodate the various constraints and circumstances that participants may have encountered during the online data collection process.

4.9 PILOT STUDY OF INSTRUMENTS

A pilot study, also known as a pretest, refers to a small-scale preliminary investigation conducted before the main research study. Its purpose is to test and refine the research methods, procedures, and instruments to ensure their effectiveness and appropriateness before implementing them on a larger scale (Majid et al., 2017). During a pilot study, a subset of participants similar to the target population is selected. This allows researchers to assess the feasibility of data collection methods, such as questionnaires or interviews, and to identify any potential challenges or limitations that

may arise during the actual study (Mills, 2019). The pilot study helps researchers determine the clarity of instructions, the comprehensibility of questions, and the length of time required for completion, and the overall feasibility of the research design (Fraser et al., 2018).

In this study, a pilot study was conducted with a sample of 40 students. The participants for the pilot study were selected randomly from the target population. The purpose of the pilot study was to assess the effectiveness of the primary questionnaire before distributing it to the larger sample. After collecting responses from the pilot study participants, the data were analysed and examined. The researcher and the supervisor reviewed the responses and identified any questions that were unclear or required improvement. This process involved scrutinising the answers to ensure that the questions were understandable and elicited the desired information. Based on the analysis and feedback received during the pilot study, necessary revisions and improvements were made to the questionnaire. The aim was to enhance the clarity and effectiveness of the questions, ensuring that they accurately captured the information required for the main study. Once the revisions were implemented, the primary study for the pilot participants was concluded. The data collected from these participants during the pilot study were not included in the final analysis of the main study. Instead, their participation served to refine the questionnaire and optimise its effectiveness for the subsequent data collection with the larger sample.

By conducting a pilot study and incorporating feedback from the participants and the supervisor, the researcher ensured that the questionnaire used in the main study was valid, reliable, and comprehensible. This process allowed for the identification and resolution of any potential issues or ambiguities before administering the questionnaire to the larger sample, thereby enhancing the overall quality and accuracy of the research findings.

4.10 DATA ANALYSIS

Data analysis is the process of examining and organising raw data to extract and interpret meaningful information. During data analysis, researchers identify themes and patterns within the data and draw conclusions based on their findings (Belotto,

2018). In quantitative analysis, data is represented numerically, and the goal is to characterise and interpret the observed phenomenon using statistical methods (Kyngäs, 2020). Qualitative analysis involves a non-numerical evaluation and interpretation of data to identify underlying meanings and relationship patterns (Turhan, 2019).

Data analysis often utilises descriptive and inferential statistics to explore relationships between concepts and constructs and gain a deeper understanding of the data (Miles, Huberman and Saldaña, 2018). In the present study, both descriptive and inferential statistics were employed to examine various components of the data relevant to the research questions and explore the relationships between different concepts in the context of web-based learning. The use of these statistical techniques allowed the researcher to derive insights from the data and provide a comprehensive analysis of the research findings.

Descriptive statistics, such as bivariate analysis and correlations, were used to identify patterns and trends in the data. These statistical measures provide an overview of the data distribution and relationships between variables. To ensure a comprehensive analysis, data collected from different sources were merged during the discussion of the findings. This allowed for the identification of meaningful patterns and linkages in relation to the phenomenon of web-based learning. The quantitative phase of the study involved quantitative analysis using the Statistical Package for the Social Sciences (SPSS) version 28.0. This software facilitated data coding, presentation, and analysis, streamlining the process for the researchers. To present the results, graphs, tables, and other figures were utilised. These visual representations help to illustrate and summarise the findings, making them more accessible and understandable to the readers.

Qualitative data collected from the participants was analysed using thematic content analysis. This analytical approach enabled the researcher to identify, analyse, and report on recurring patterns within the data. Thematic content analysis involves systematically examining the data to identify significant themes or patterns that emerge from the participants' responses (Castleberry and Nolen, 2018). According to Kiger

and Varpio (2020), there is no definitive right or wrong approach to data analysis in qualitative research. Researchers have the flexibility to choose the most suitable method based on the research objectives and the nature of the data.

In this study, qualitative data analysis was conducted through online interviews with DUT lecturers, and a rigorous thematic and content analysis was applied. The foundation of this analysis involved examining the data for recurring instances or themes that captured the essence of the participants' experiences and perspectives. These recurring instances were systematically identified across the dataset and grouped together using a coding system. Thematic content analysis allowed for a detailed exploration of the qualitative data, providing a deeper understanding of the participants' viewpoints and insights. By applying this method, the researcher was able to identify and report on key themes that emerged from the data, enhancing the overall richness and interpretation of the findings.

4.10.1 Frequency analysis

Frequency analysis is a statistical technique used to examine the frequency distribution of variables or categories within a dataset. It involves counting the number of occurrences of each value or category and presenting the results in a frequency table or chart. In this analysis, the researcher looked at how often different values or categories appear in the dataset. This provided insights into the distribution and patterns of the data. It is particularly useful for categorical or discrete variables, where the data is divided into distinct categories or groups.

Frequency analysis served two primary purposes in this study. Initially, it was employed to validate the coding process and ensure the accuracy and consistency of categorising the data. By conducting frequency analysis, the researcher could confirm the correct application of coding techniques to the dataset. Subsequently, frequency analysis was utilised to quantify the occurrence and mention of specific statements or response categories provided by the participants. This facilitated the summarisation and quantification of the data, presenting the frequency or count of cases falling into each response category outlined in the research questionnaire. Through frequency analysis, the researcher effectively communicated the overall findings of the study in a

clear and concise manner. It allowed for the visualisation of response distribution across various categories, emphasising the prevalence or frequency of each category among the participants' answers.

4.10.2 Descriptive analysis

This type of analysis is a statistical technique employed to summarise and describe the main characteristics, patterns, and trends within a dataset, aiming to organise, present, and provide a meaningful interpretation of the data (Mishra et al., 2019). In this study, descriptive analysis involved the use of graphs and frequency analysis to summarise and enhance the comprehensibility of the data. Furthermore, Kaliyadan and Kulkarni (2019) emphasise that descriptive analysis can be applied to create profiles of individuals, groups, teams, or other subjects by considering variables such as composition, size, interests, and productivity. This enables a comprehensive understanding of the attributes and characteristics of the subjects being studied.

The application of descriptive statistics in this investigation served two main purposes. First, it facilitated a quantitative description of the phenomena under investigation, sample sizes, and other crucial components of the data. Descriptive statistics provided numerical measures, including measures of central tendency and measures of dispersion, which contribute to a quantitative depiction of the data. Second, descriptive statistics were employed to summarise the entire dataset, condensing the data in a concise and meaningful manner. This involved calculating frequencies, percentages, or proportions for categorical variables, as well as generating summary statistics for continuous variables. These summaries provided a comprehensive overview of the data, aiding in the identification of key trends, patterns, or characteristics within the dataset.

4.10.3 Correlations

Correlation statistical analysis is a method used to measure the association between or among variables. It helps determine the extent to which variables interact and the nature of their interaction (Spagnoli and Shimobe, 2020). In correlation tests, values such as +5 and -5 indicate the degree of correlation between two variables, indicating

the strength and direction of the relationship (Shi et al., 2020). In this study, correlation analysis was utilised to identify and understand the important factors influencing web-based teaching and learning at the DUT. By examining the correlations between different variables, the researcher aimed to identify the relationships and dependencies among these factors. The analysis provided insights into the degree and direction of the associations, helping to determine which factors were significantly linked to web-based teaching and learning. By uncovering these critical factors, the study aimed to contribute to the understanding of effective practices and potential improvements in web-based teaching and learning at the DUT.

4.11 RELIABILITY

There are two major ideas that are used to assess the quality of research: reliability and validity (Sürücü and Maslakçı, 2020). These are used to determine how truthful a study is. Reliability refers to the consistency, stability, and dependability of a measurement instrument or research findings. It assesses the extent to which a measurement or test consistently produces the same results under similar conditions. Reliability is crucial in research as it ensures that the data collected, and the measurements taken are reliable and trustworthy (Belur et al., 2021). In the study, efforts were made to address reliability by using standardised questionnaires and providing clear instructions to the respondents. This helped in minimising potential variations in the administration of the questionnaire, thereby increasing the consistency of the data collected. Additionally, conducting a reliability test was also necessary to assess the degree of consistency between the measure used in the study and the true measure it intended to capture. By examining the reliability of the measurement instrument, the researcher could gain confidence in its accuracy and trustworthiness.

4.12 VALIDITY

Validity in research refers to the extent to which a research tool accurately and authentically measures what it is intended to measure, reflecting the level of confidence placed in the obtained findings (FitzPatrick, 2019). The concept of validity, as explained by Efron and Ravid (2013), is closely tied to the quality and appropriateness of the methods used to collect data. It is considered valid when an

instrument effectively captures the intended concepts or constructs it was designed to measure (Babbie, 2013). To ensure the validity of the research content, several steps were taken. First, piloting of the questionnaire was conducted with the target population. This involved testing the questionnaire with a subset of participants who closely resembled the intended sample. The purpose of piloting was to assess the clarity, relevance, and appropriateness of the questionnaire, allowing for refinements to be made to enhance its validity. By piloting the questionnaire, the researcher aimed to ensure that it accurately measured the intended constructs and provided valid data.

In addition to piloting, the study sought the expertise of recognised experts in the field. These experts were approached to provide their opinions on the validity of the research tool. By seeking expert judgement, the researcher obtained valuable insights and feedback on the suitability of the questionnaire in effectively measuring the intended concepts. This external input contributed to establishing the validity of the instrument and bolstered confidence in the accuracy of the obtained findings. Through the implementation of these measures, the study aimed to ensure the validity of the research tool and, consequently, the validity of the research outcomes.

4.13 DATA QUALITY CONTROL

Data quality refers to the degree to which data is accurate, reliable, complete, and relevant for the intended purpose of the research or analysis. It encompasses various aspects of data, including its accuracy, consistency, completeness, timeliness, and relevance. Accurate data is free from errors and represents the true values or characteristics of the variables being measured. It is obtained through careful data collection processes, accurate measurements, and proper documentation (Amin et al., 2020). To ensure data quality in this study, the research objectives and data requirements were clearly defined, enabling a focused approach to data collection and ensuring the collected data's relevance. A robust data collection methodology was designed, incorporating suitable instruments and procedures that aligned with the research objectives, thereby facilitating the acquisition of reliable and valid data. Pilot testing was conducted to identify and address any issues or challenges prior to the actual data collection phase. Standardised data collection procedures were implemented to ensure consistency across different collectors and sites.

4.13.1 Credibility

Credibility pertains to the dependability and trustworthiness of the information, findings, and conclusions derived from a study, and is crucial in research to ensure the accuracy, validity, and acceptance of results within the scientific community and society (Rose and Johnson, 2020). A credible research study demonstrates several essential characteristics. Foremost, a rigorous and well-structured methodology is indispensable. It entails a clear and logical framework with a precisely defined research question or objective. The research design defines the methods employed to collect and analyse data, guaranteeing a rigorous and systematic approach. Adherence to established research standards and protocols enhances the credibility of the study (Stahl and King, 2020).

Additionally, the quality of the collected data plays a pivotal role in establishing credibility. To ensure credibility in the study, the researcher employed appropriate data collection techniques, implemented quality control measures, and addressed potential biases or confounding factors to ensure the accuracy, reliability, and representativeness of the gathered data. Transparency and ethical considerations also contribute significantly to credibility. The researcher openly disclosed any conflicts of interest, funding sources, and potential biases that could influence the study's outcomes. The study adhered to ethical guidelines and protocols, including obtaining informed consent from participants, safeguarding privacy, and confidentiality, and ensuring the welfare of the subjects.

4.13.2 Transferability

Transferability in research refers to the extent to which research findings and conclusions can be applied or generalised to other contexts or populations beyond the specific study. It involves assessing the degree to which the results can be relevant, meaningful, and applicable in different settings or to different individuals or groups (Hamdan, Ashour and Daher, 2021). To enhance transferability, researchers should consider several key factors. The selection of the study sample should be carefully considered to ensure diversity and representation. The sample should include participants who reflect the characteristics, demographics, and contexts relevant to the

population of interest. This helps to increase the potential transferability of the findings to similar populations or contexts.

In this study, the researcher provided rich and detailed descriptions of the research methodology, data collection techniques, and context of the study. By providing this documentation, other researchers can evaluate the relevance and applicability of the findings to their own contexts or populations. Furthermore, the researcher engaged in reflexive and transparent practices. This involved critically reflecting on own biases, assumptions, and perspectives that may influence the research process and findings. By openly discussing these influences and limitations, readers can better evaluate the potential transferability of the results.

4.13.3 Dependability

Dependability in research refers to the consistency, reliability, and trustworthiness of the research process and findings. It involves establishing the stability and consistency of the study's methods, procedures, and outcomes, ensuring that they can be relied upon to produce consistent and dependable results (Belotto, 2018). To ensure dependability, the researcher provided in-depth descriptions of participants' responses. This included capturing and documenting participants' perspectives, experiences, and insights with rich detail and clarity. By offering comprehensive descriptions of participants' responses, the researcher enhanced the dependability of the study as this allowed for a deeper understanding and interpretation of the data.

4.13.4 Conformability

Conformability in research refers to the objective and unbiased approach taken by researchers in gathering and analysing the data collected (Mohajan, 2018). It signifies that the findings and analysis are solely based on the data obtained from the participants during the semi-structured interviews, without any undue influence from the researcher. To achieve conformability, the researcher ensured that the voices of the participants were accurately represented. This was done by using direct quotations whenever possible, allowing the participants' own words to be heard. In cases where translation was necessary, the researcher ensured that the translated text

appropriately conveys the intended meaning and maintains the integrity of the participants' responses. Additionally, the researcher approached the study with an open mind and without preconceived notions about the expected findings. By setting aside any biases or preconceptions, the researcher was able maintain objectivity and allow the data to shape the analysis and interpretation.

4.13.5 Authenticity

Authenticity in research relates to being genuine, truthful, and dependable, encompassing endeavours to accurately represent the realities, experiences, and perspectives of both participants and the phenomenon under examination (Hayashi, Abib and Hoppen, 2019). In this study, the pursuit of authenticity involved giving prominence to diverse voices and perspectives. This encompassed the selection of a representative sample comprising participants relevant to the research objectives. Furthermore, the establishment of rapport and trust with participants was considered vital for fostering authenticity. By building respectful and collaborative relationships, a safe and supportive environment was created, enabling participants to share their experiences openly and honestly. When reporting the research findings, transparency and honesty were paramount. This entailed faithfully representing the voices of the participants using direct quotations or excerpts from interviews or other sources. Additionally, contextual information was provided to assist readers in comprehending the authenticity of the findings.

4.14 ETHICAL CONSIDERATIONS

Ethical considerations are to the principles and guidelines that guide the responsible and ethical conduct of research. These considerations are designed to protect the rights, welfare, and dignity of the individuals or groups involved in the research process. Ethical considerations provide a framework for researchers to ensure that their studies are conducted in an ethical and morally sound manner (Babbie, 2013). Ethical considerations in research are of paramount importance as they ensure the protection of the rights, welfare, and dignity of the participants involved in the study (Brittain et al., 2020). Researchers must adhere to ethical principles and guidelines to ensure that their research is conducted in an ethically sound manner. Robertson

(2021) identifies three research ethical principles, namely, justice, beneficence, and regard for human dignity. When participants are free of damage, exploitation, and risk, the beneficence principle applies.

In this study, ethical considerations were carefully addressed to protect the rights and well-being of the participants. Several measures were taken to ensure ethical compliance and minimise potential harm. Firstly, participants were provided with clear and comprehensive information about the research objectives. This was done both verbally and in written form, through the distribution of a consent form (Appendix 2), a letter of information, and questionnaires (Appendix 1). These documents outlined the purpose of the study, the nature of their involvement, and any potential risks or benefits associated with participation. Secondly, participants were not exposed to any physical or psychological harm as the study primarily focused on the cognitive domain and involved survey questions that did not require any testing or interventions.

The researcher also addressed specific ethical considerations in accordance with DUT's Research Ethics Policy and Guidelines (2015). This included addressing issues related to informed consent, deception (if applicable), recruitment procedures, risk to participants, sponsorship and benefits, confidentiality, conflicts of interest, and indemnity. By adhering to these guidelines, the researcher ensured that ethical standards were upheld throughout the research process. Furthermore, the study received ethical category 2 approval, indicating that it met the requirements for minimal research ethics compliance. This approval was granted by the Ethics Committee, which ensured that participants were adequately informed and treated fairly.

The researcher followed the appropriate procedures to obtain permission for conducting the research through the DUT review process. After the research proposal was reviewed and approved by the institution, clearance was granted to proceed with the study. In the survey component of the research, participants were required to respond to questions in writing, while those who took part in in-depth face-to-face interviews were expected to provide vocal responses. To maintain confidentiality, the researcher ensured that responses from participants were kept confidential. Personal information such as gender and age, along with the findings of the study, were reported

anonymously in the research report. Participants were assured that their names would not be published, and the data collected would only be used for academic purposes.

Before conducting the interviews and distributing the questionnaires, participants were explicitly informed about their privacy and confidentiality rights. They were assured that their identities would be protected, and they were given the freedom to choose not to answer any questions they were uncomfortable with, in order to uphold their constitutional right to human dignity. Significant attention was devoted to the following ethical considerations:

- **Ensuring respondents are giving informed consent**

The respondents were informed of the study's nature and objectives.

- **Ensuring that participants are not harmed**

All the participants were over the age of 18. Their contribution in the research was entirely voluntary, and they were informed that if they wished, they could stop taking part in the study at any moment. The DUT review process carefully considered the likelihood of the research injuring participants and concluded that the researcher was correctly handling this concern.

- **Ensuring that permission is obtained**

This study involved students and academics from DUT. Each participant gives consent to conduct research relating to his or her work by participating in this study.

- **Ensuring Confidentiality and anonymity**

Participants' anonymity and confidentiality were protected because no names were to be utilised or disclosed in the final write-up or at any other stage or after the thesis was completed. Participants were provided assurances that allowed them to interact freely and provide genuine information about their opinions and experiences with web-based teaching and learning.

4.15 CONCLUSION

This chapter provided detailed information about the research strategy and methodology employed in the study. The researcher took all necessary precautions to ensure the study was conducted effectively and ethically. The research methodology section included a comprehensive description of the data gathering techniques, research design, and data collection methods employed. It also addressed the philosophical underpinnings and overall strategies guiding the research process, providing readers with a clear understanding of how the study was conducted and the rationale behind the chosen approach. The chapter further delved into the administration of data collection and data analysis procedures. The researcher explained how the questionnaire and interviews were managed, ensuring that respondents understood the instructions and were able to provide accurate and meaningful responses. This attention to detail enhances the reliability and validity of the data collected. The findings of the study, along with their subsequent discussion and interpretation are presented in the next chapter.

CHAPTER 5: DATA ANALYSIS, INTERPRETATION AND DISCUSSION

5.1 INTRODUCTION

The main objective of this chapter is to present a comprehensive analysis of the data collected, which is then examined in relation to the study's objectives. The data was collected from university students and lecturers, utilising different methods for each group. The student data was obtained through a questionnaire, while the lecturers were interviewed using a predetermined interview schedule. As mentioned earlier, a total of 380 students and 10 lecturers participated in the study. The student data was analysed using the statistical software SPSS, generating frequency tables, which were then exported to Microsoft Excel to create tables and graphs for visualisation.

In this chapter, the findings are presented in the form of tables, charts, and pie graphs to provide a clear representation of the data. The data collected through the interviews was analysed thematically. Thematic analysis involves identifying recurring themes, patterns, and concepts within the interview data. By using this approach, the researcher gained deeper insights into the perspectives and experiences of the participating lecturers. In addition to the data analysis, this chapter addresses specific research inquiries that were investigated in the study. These research inquiries were carefully formulated to explore and provide answers to the research questions identified in the earlier sections of the study.

The following specific research inquiries were addressed by this study:

- How effective is web-based teaching and learning?
- What challenges are associated with web-based teaching and learning?
- What is the correlation between academic assistance/engagement and students' performance?
- What framework can be used to provide practical strategies needed to overcome challenges associated with web-based teaching and learning?

5.2 OVERVIEW OF RESPONDENTS AND RESPONSE RATE

A link to participate in the study was distributed to a population of 33 000 DUT students through the DUT Pinboard platform. Out of 33 000 students, 380 responses were received, matching the sample size required (379).

5.3 RESEARCH INSTRUMENT

The research questionnaire was structured into three distinct sections to gather specific information from the participants. Section A focused on collecting data related to demographics and background information of the respondents. This section aimed to provide contextual information about the participants which could be useful for understanding any potential relationships or patterns in the data. Section B of the questionnaire aimed to gather strategic information about the activities and experiences related to web-based learning. It consisted of closed-ended questions, which required participants to select their responses from a predetermined set of options. These questions aimed to gather quantitative data that could be analysed and compared between different participants. Following the closed-ended questions in Section B, the questionnaire included open-ended questions in Section C. This section allowed respondents to provide detailed and free-text responses, offering them an opportunity to express their thoughts, opinions, and experiences in their own words. The open-ended questions aimed to gather qualitative data that could provide deeper insights and perspectives on the research topic. The questionnaire utilised a five-point Likert scale for the closed-ended questions, providing participants with a range of response options to indicate their level of agreement or disagreement. This scale allowed for the measurement of attitudes, opinions, and perceptions on the topic being investigated. To ensure the reliability of the questionnaire, a reliability test was conducted. This test assessed the internal consistency and stability of the questionnaire items. By analysing the responses and calculating measures such as Cronbach's alpha coefficient, the researcher determined the reliability of the questionnaire and the consistency of the data collected.

5.4 RELIABILITY TEST

The questions in the questionnaire were formulated based on the findings of the literature review so were aligned with the relevant concepts and variables identified in previous research. This approach helped to establish the content validity of the questionnaire by ensuring that it covered the essential aspects of the research topic. To assess the reliability of the questionnaire, Cronbach's alpha coefficient was used. Cronbach's alpha is a statistical measure that evaluates the internal consistency of a set of items within a questionnaire or scale. It measures the extent to which the items in a questionnaire consistently measure the same underlying construct or variable (Sürücü and Maslakçi, 2020).

In this study, the reliability of the questionnaire was evaluated using Cronbach's alpha coefficient, and the result was found to be 0.958 (Table 5.1). A Cronbach's alpha value of 0.958 indicates a high level of internal consistency among the items in the questionnaire. Generally, a Cronbach's alpha coefficient above 0.7 is considered acceptable for research purposes, indicating good reliability.

Table 5.1: Cronbach's alpha

Case Processing Summary		N	%
Cases	Valid	379	99.7
	Excluded ^a	1	0.3
	Total	380	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
0.958	20

5.1 DEMOGRAPHICS

Demographics of the respondents were gender, race, and age.

5.4.1 Gender

Table 5.2: Gender of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	157	41.3	41.3	41.3
	Female	222	58.4	58.4	99.7
	Other	1	0.3	0.3	100.0
	Total	380	100.0	100.0	

Table 5.2 shows that the majority of the respondents belonged to the female group, with a percentage of 58.4%. The male group accounted for 41.3% of the respondents, while the "other" group constituted 3% of the total participants. These findings indicate that there were more female students participating in the study than males. The distribution of respondents aligns with the demographics of the university, which has a higher enrollment of female students compared to males. Therefore, the findings reflect the actual gender composition of the student population at the university.

5.4.2 Race

Table 5.3: Race of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Black	283	74.5	74.5	74.5
	White	33	8.7	8.7	83.2
	Coloured	27	7.1	7.1	90.3
	Asian	37	9.7	9.7	100.0
	Total	380	100.0	100.0	

Table 5.3 shows that the majority of the respondents belonged to the Black category, with the highest percentage of 74.5%. The Asian category accounted for 9.7% of the respondents, followed by the White category at 8.7%, and the Coloured category at 7.1%. These results suggest that a larger proportion of Black individuals participated in the study compared to individuals from other racial categories. These findings align

with the demographic profile of the university's student population, where there is a higher enrollment of Black students compared to other racial groups. Therefore, the results provide an accurate reflection of the racial composition of the sample, considering the larger representation of the Black category.

5.4.3 Age

Table 5.4: Age of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-23	250	65.8	65.8	65.8
	24-26	41	10.8	10.8	76.6
	27-30	37	9.7	9.7	86.3
	Above 30	52	13.7	13.7	100.0
	Total	380	100.0	100.0	

Table 5.4 shows that the largest percentage of respondents fell within the 21-23 years old age category, accounting for 65.8% of the participants. This was followed by the above 30 years old age category, comprising 13.7% of the respondents. The 24-26 years old age category accounted for 10.8%, and the 27-30 years old age category represented 9.7% of the participants. These statistics indicate that the majority of the respondents were adults who had reached the age of majority in South Africa, which is 18 years old. The age diversity within the sample allowed for the collection of perspectives from both mature students and those in their teenage years. A broad range of ages such as this provides a comprehensive understanding of the phenomenon under investigation, as it incorporates perspectives from different stages of adulthood.

5.5 EFFECTIVENESS OF THINK LEARN ZONE

5.5.1 Activities on Think Learn Zone are designed to get the best out of students

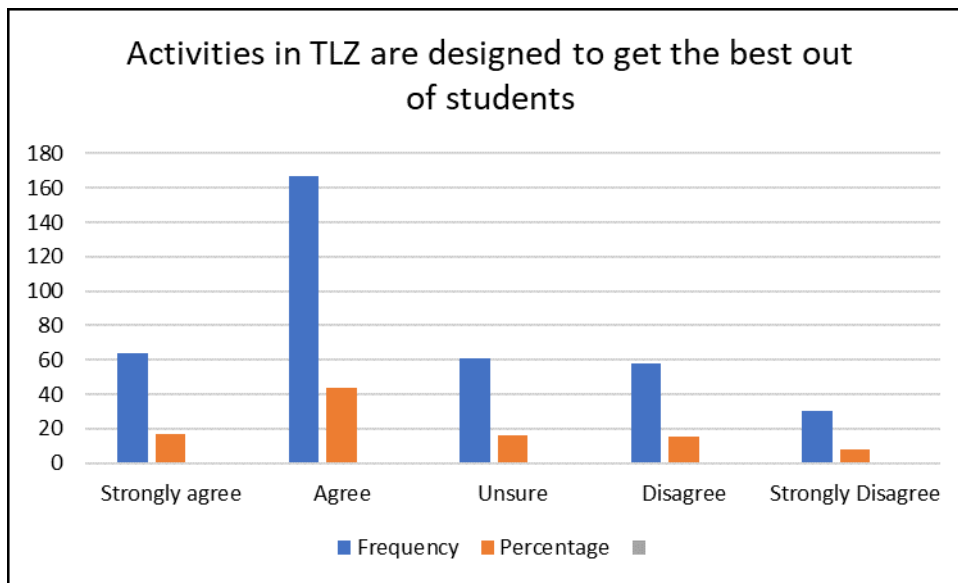


Figure 5.1: Activities on Think Learn Zone are designed to get the best out of students

Figure 5.1 shows the distribution of respondents' opinions on the activities designed to get the best out of students. The largest percentage of respondents fell into the "agree" category, accounting for 43.9% of the participants. This was followed by the "strongly agree" category at 16.8%, "unsure" at 16.1%, "disagree" at 15.3%, and "strongly disagree" at 7.9%. The majority of respondents strongly agreed that the activities on the Think Learn Zone (TLZ) were designed to maximise students' potential. However, it is important to note that 7.9% of the respondents did not agree with this statement. This suggests that there may be areas for improvement, and it highlights the need for lecturers to ensure that the course structure is user-friendly, with clear navigation and a logical progression of materials.

The existing literature supports the notion that web-based learning can be effective in enhancing student learning outcomes when it is well-designed and incorporates features known to facilitate learning, such as interactivity, multimedia, and regular feedback (Castro and Tumibay, 2021). However, it is important to recognise that the effectiveness of online learning is influenced by various individual factors, including student motivation, engagement, and prior knowledge (Esra and Sevilen, 2021).

Taking these findings and literature into consideration, it is evident that designing and implementing web-based learning activities that cater to the diverse needs and preferences of students can contribute to a more effective and engaging learning experience. By addressing the concerns raised by the minority of respondents who disagreed or were unsure, lecturers can strive to create an environment that promotes optimal learning outcomes and student satisfaction.

5.5.2 Think Learn Zone helps students understand lecture notes

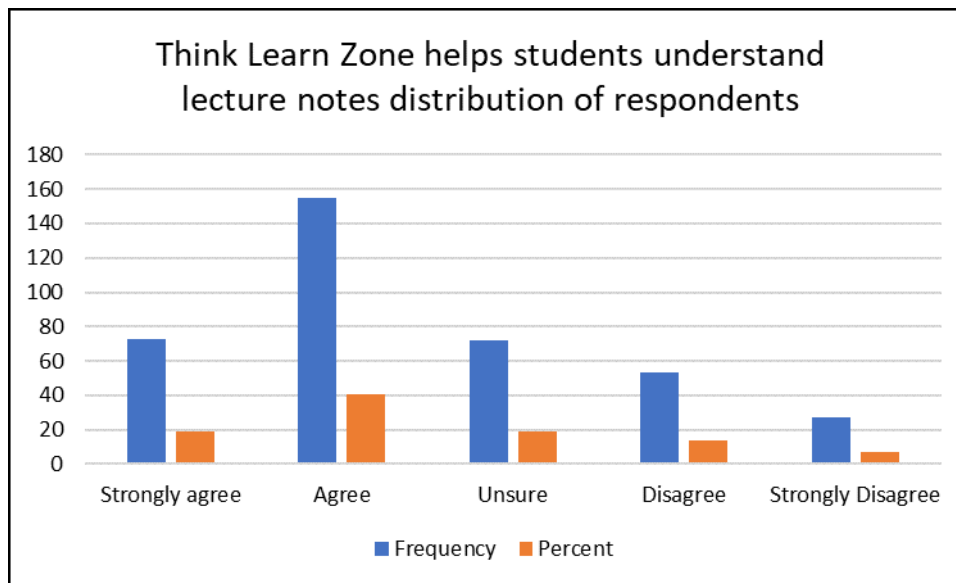


Figure 5.2: Think Learn Zone helps students understand lecture notes

Figure 5.2 shows the distribution of respondents' opinions on the effectiveness of the TLZ in helping them understand lecture notes. The largest percentage of respondents fell into the "agree" category, accounting for 40.8% of the participants. This was followed by the "strongly agree" category at 19.2%, "unsure" at 18.9%, "disagree" at 13.9%, and "strongly disagree" at 7.1%. The majority of respondents agreed that the TLZ assists them in comprehending lecture notes. However, it is worth noting that 7.1% of the respondents strongly disagreed with this statement, suggesting that there is room for improvement in the design and delivery of TLZ to better support students' understanding of lecture materials. To address this, integrating multimedia content, such as videos, audio, and images, into the TLZ courses could be beneficial. This can provide alternative modes of content delivery that cater to diverse learning styles and preferences. By incorporating various multimedia elements, students who may

struggle with reading or comprehending written text can be better supported in their learning process.

These findings align with the conclusions drawn by Francisco (2020), who emphasised that web-based learning can be highly effective in helping students understand notes and course materials. It offers a dynamic and interactive learning environment that provides access to a wide range of resources, as well as opportunities for collaboration and personalised learning. Considering the results and the existing literature, it is evident that enhancing the TLZ with multimedia content and interactive features can contribute to a more engaging and effective learning experience.

5.5.3 Think Learn Zone helps students catch up on missed lectures

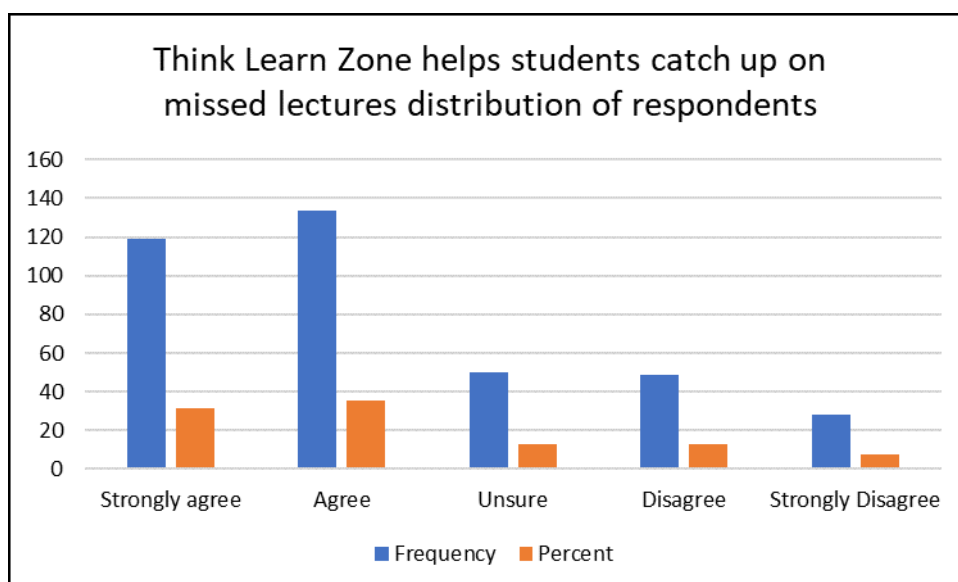


Figure 5.3: Think Learn Zone helps students catch up on missed lectures

Figure 5.3 presents the distribution of respondents' opinions on whether lecture notes available on the TLZ help them with revision. The largest percentage of respondents fell into the "agree" category, accounting for 35.3% of participants. This was followed by the "strongly agree" category at 31.3%, "unsure" at 13.2%, "disagree" at 12.9%, and "strongly disagree" at 7.4%. The combined percentage of respondents who expressed positive views (agree and strongly agree) was 66.6%, while the negative views (disagree and strongly disagree) accounted for 20.3%. Respondents who were unsure about the statement represented 13.2% of the participants. These findings

indicate that a significant majority of students believe that the availability of lecture notes on the TLZ platform is beneficial for their revision process.

The results suggest that uploading lecture materials on the TLZ platform is highly advantageous for many students, especially in cases where they have missed lectures due to various reasons. The accessibility of lecture notes online allows students to catch up on missed content at their convenience, ensuring that they can review the material and stay up to date with the course requirements. According to Chandra and Fisher (2009), web-based learning can be an effective means of catching up on missed classes. Online resources such as recorded lectures, online tutorials, and digital textbooks offer the flexibility of accessing and reviewing course materials at any time. This convenience is particularly helpful for students who may have missed a class or need to review specific concepts. However, it is crucial to acknowledge that web-based learning should not be considered a complete substitute for in-person instruction. While it provides the convenience of accessing materials remotely, it may not offer the same level of interaction and feedback as a live classroom environment. Therefore, it is important for students to maintain communication with their lecturers and classmates to ensure a comprehensive understanding of the material and to stay on track with the course.

5.5.4 Lecture notes available on Think Learn Zone help me revise distribution of respondents

Table 5.5: Lecture notes and slides

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	116	30.5	30.5	30.5
	Agree	155	40.8	40.8	71.3
	Unsure	43	11.3	11.3	82.6
	Disagree	42	11.1	11.1	93.7
	Strongly Disagree	24	6.3	6.3	100.0
	Total	380	100.0	100.0	

Table 5.5 presents the distribution of respondents' opinions on whether lecture notes available on the TLZ platform help them with revision. The largest percentage of respondents fell into the "agree" category, accounting for 40.8% of participants. This was followed by "strongly agree" at 30.5%, "unsure" at 11.3%, "disagree" at 11.1%, and "strongly disagree" at 6.3%. The combined percentage of respondents who expressed positive views (agree and strongly agree) was 71.3%, while the negative views (disagree and strongly disagree) accounted for 17.4%. Respondents who were unsure about the statement represented 11.3% of the participants. These findings indicate that a significant majority of students believe that the availability of lecture notes on the TLZ platform is beneficial for their revision after lectures. The results suggest that the integration of technology, such as the TLZ platform, has facilitated students' ability to attend classes and complete coursework online. This has provided greater flexibility and accessibility to education, allowing students to access lecture notes and slides at their convenience for revision purposes.

The use of technology in education has transformed the learning landscape, enabling students to engage with course materials beyond traditional classroom settings. Online platforms like TLZ offer students the opportunity to review lecture materials at their own pace, reinforcing their understanding of the content and supporting their revision efforts. The findings align with the broader trend of technology-enhanced learning, which emphasises the benefits of digital resources in improving educational outcomes. By leveraging the advantages of online platforms and providing students with easily accessible lecture notes, educational institutions can enhance the learning experience and promote self-directed learning.

5.5.5 Think Learn Zone is a useful mean of contacting staff members

Table 5.6: Think Learn Zone is a useful mean of contacting staff members

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	45	11.8	11.8	11.8
	Agree	116	30.5	30.5	42.4
	Unsure	89	23.4	23.4	65.8
	Disagree	94	24.7	24.7	90.5

Strongly Disagree	36	9.5	9.5	100.0
Total	380	100.0	100.0	

Table 5.6 presents the distribution of respondents' views on whether TLZ is a useful means of contacting staff. The largest percentage of respondents fell into the "agree" category, accounting for 30.5% of participants. This was followed by "disagree" at 24.7%, "unsure" at 23.4%, "strongly agree" category at 11.8%, and "strongly disagree" at 9.5%. The combined percentage of respondents who expressed positive views (agree and strongly agree) was 42.3%, while those with negative views (disagree and strongly disagree) accounted for 34.2%. Respondents who were unsure about the statement represented 23.4% of the participants. These findings indicate that a significant proportion of respondents agreed that TLZ is a useful means of contacting lecturers, while a considerable percentage disagreed or were unsure. The results suggest that TLZ serves as an effective communication channel for students to connect with their lecturers. It provides various avenues such as email, chat, discussion forums, and video conferencing, enabling students to engage in real-time communication and seek clarification or assistance from their lecturers. The majority of respondents who agreed with the statement likely found TLZ to be a convenient and accessible platform for interacting with staff members. However, it is important to note that a considerable number of respondents disagreed or were unsure about TLZ's usefulness for contacting staff. This may indicate that some students encounter difficulties or challenges with online communication or prefer alternative methods of reaching out to their lecturers. Factors such as diverse backgrounds, languages, and ethnicities could contribute to these differing perspectives and experiences.

The findings align with previous research by Jena (2020) and Haleem et al., (2022), who highlight the benefits of web-based learning in facilitating communication between students and lecturers. Web-based platforms offer convenience and flexibility, allowing students to connect with staff members regardless of their physical location. However, it is essential to recognise that effective communication is a collaborative process, requiring active engagement from both lecturers and students to ensure its success. Moreover, it is crucial to acknowledge that web-based communication may lack the personal touch and nonverbal cues associated with face-to-face interaction.

Establishing rapport and building a good working relationship with lecturers in a web-based environment requires effort and strategies to overcome these limitations.

5.5.6 The design of Think Learn Zone makes me want to explore the different ways to best use this tool

Table 5.7: The design of Think Learn Zone makes me want to explore the different ways to best use this tool

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	47	12.4	12.4	12.4
	Agree	142	37.4	37.4	49.7
	Unsure	88	23.2	23.2	72.9
	Disagree	73	19.2	19.2	92.1
	Strongly Disagree	30	7.9	7.9	100.0
	Total	380	100.0	100.0	

Table 5.7 presents the distribution of respondents' views on whether the design of TLZ makes them want to explore this tool. The largest percentage of respondents fell into the "agree" category, accounting for 37.4% of participants. This was followed by "unsure" at 23.3%, "disagree" at 19.2%, "strongly agree" at 12.4%, and "strongly disagree" at 7.9%. When combining the percentages of respondents who expressed positive views (agree and strongly agree), 49.8% of respondents were in support of the statement. On the other hand, 27.1% of participants disagreed, and 23.3% were unsure about whether TLZ's design encouraged them to explore the tool. The findings suggest that a majority of respondents are confident in TLZ's design, perceiving it as user-friendly and inspiring them to explore its features. They believe that the design of TLZ encourages them to make better use of the tool and engage more effectively with their learning materials.

These results align with the recommendations of Maslov, Nikou and Hansen (2022), who emphasise the importance of designing LMSs to be user-friendly. A user-friendly design ensures that the platform is easy to navigate, intuitive to use, and provides a positive user experience. Modern online learning systems aim to create a favourable user experience that facilitates learner engagement and academic success

(Mwengwa, 2022). However, it is important to acknowledge that a significant portion of respondents disagreed or were unsure about TLZ's design motivating them to explore the tool. This may indicate that some students have encountered challenges or limitations in utilising TLZ's features or have not fully explored its potential. It is crucial for the institution and lecturers to address these concerns and provide support or training to enhance students' engagement with TLZ.

5.5.7 Think Learn Zone serves as backup for materials and handouts that were given in class

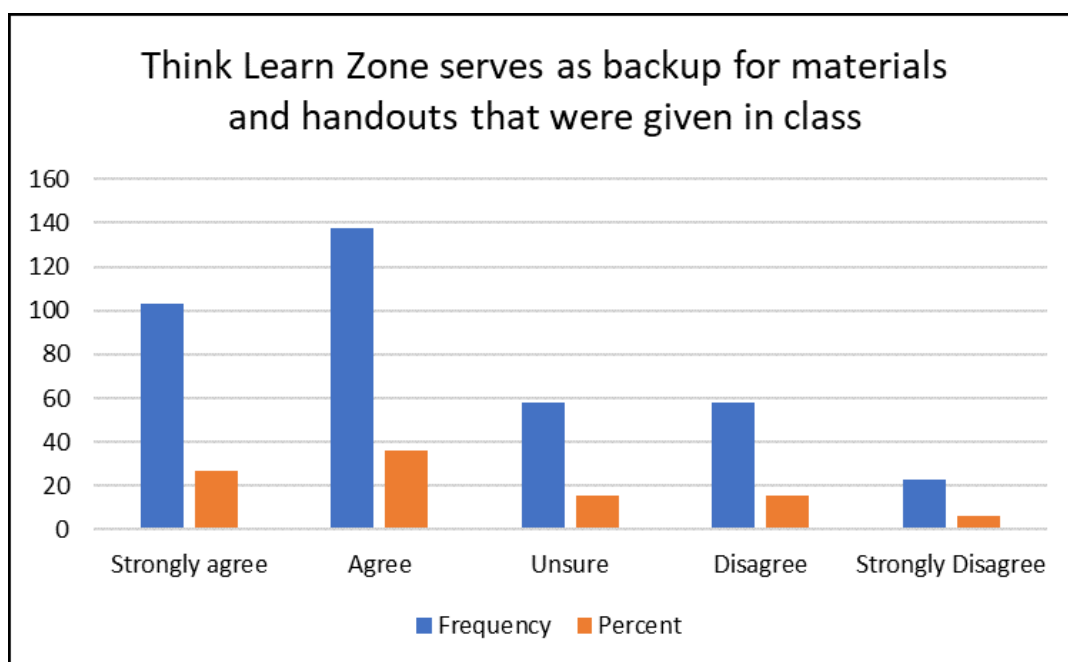


Figure 5.4: Think Learn Zone serves as backup for materials and handouts that were given in class

Figure 5.4 illustrates the distribution of respondents' views on whether TLZ serves as a backup for class handouts. The largest percentage of respondents, 36.3%, fell into the "agree" category, indicating that they believe TLZ functions as a supplementary resource for materials and handouts provided during class. This was followed by the "strongly agree" category at 27.1%. On the other hand, 15.3% of respondents expressed uncertainty, as they were unsure whether TLZ serves as a backup for class handouts. Additionally, 15.3% disagreed with the statement, indicating that they did not perceive TLZ as a reliable source for accessing materials and handouts from class. The "strongly disagree" category accounted for 6.1% of participants. Combining the

percentages of respondents who agreed and strongly agreed, we find that 63.4% of respondents believed that TLZ served as a backup for class handouts. Conversely, 21.4% disagreed with this statement, and 15.3% were uncertain about TLZ's role as a backup resource. These findings indicate that a significant portion of respondents recognise TLZ as a valuable tool for accessing and reviewing class materials. They believe that TLZ serves as a supplementary resource that enhances their access to handouts and materials shared during class sessions.

However, it is important to note that a considerable proportion of participants either disagreed or expressed uncertainty regarding TLZ's effectiveness as a backup for class handouts. This suggests that some students may encounter challenges in accessing or utilising TLZ to retrieve materials provided in class. It is crucial for the institution and lecturers to address these concerns, provide additional support, and ensure that TLZ is effectively utilised to facilitate access to relevant course materials.

5.5.8 Think Learn Zone enables me to ask questions that I normally find it hard to ask in class

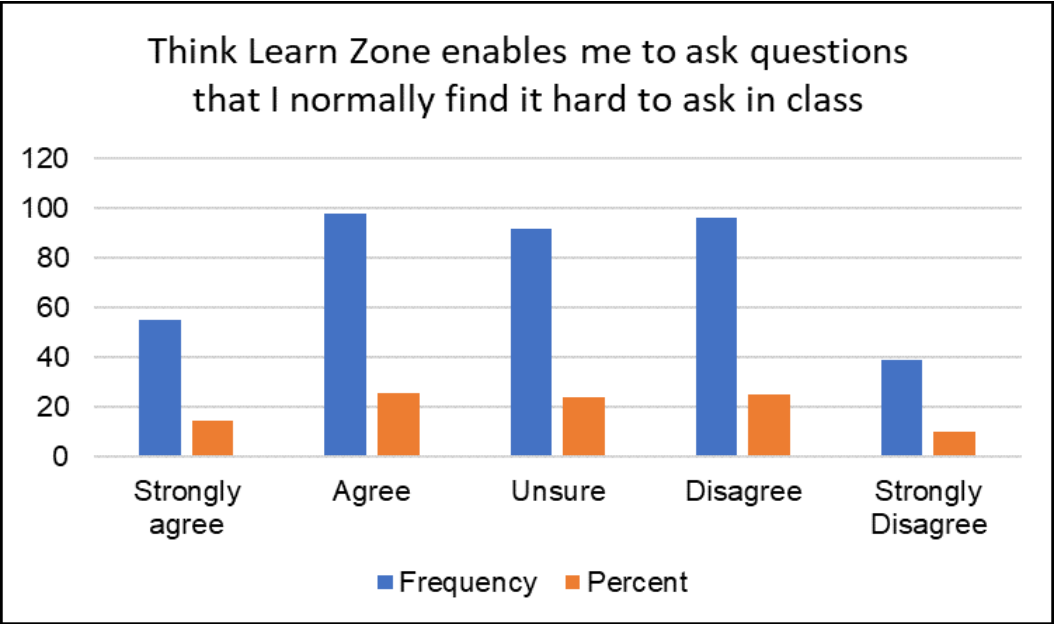


Figure 5.5: Think Learn Zone enables me to ask questions that I normally find it hard to ask in class

Figure 5.5 depicts the distribution of respondents' views on whether TLZ enables students to ask questions. The largest percentage of respondents, 25.8%, fell into the

"agree" category, indicating that they believe TLZ facilitates the ability to ask questions during their online learning experience. This was followed by the "disagree" category at 25.3%, suggesting that a significant portion of respondents do not perceive TLZ as effective in enabling them to ask questions. Additionally, 24.2% of respondents expressed uncertainty, as they were unsure whether TLZ provides an effective platform for asking questions. The "strongly agree" category accounted for 14.5% of participants, while the "strongly disagree" category represented 10.3%. When combining the percentages of respondents who agreed and strongly agreed, we find that 40.3% of respondents believe that TLZ enables them to ask questions. Conversely, 36.2% disagreed with this statement, and 24.2% expressed uncertainty about TLZ's effectiveness in this regard. These findings suggest a divided perception among respondents regarding TLZ's ability to facilitate student engagement and the asking of questions. While a considerable proportion of participants agree that TLZ supports the interaction necessary for asking questions, there is an almost equal percentage of respondents who disagree or express uncertainty about TLZ's effectiveness in this aspect. The high percentage of respondents who were unsure about TLZ's facilitation of asking questions may indicate a lack of clarity or limited experience with using the platform for interactive engagement. It is essential for educators and the institution to provide clear guidelines and opportunities for students to actively participate and ask questions within the TLZ environment.

It is worth noting that the findings align with existing literature that suggests online classes may present challenges in terms of student engagement compared to traditional face-to-face classrooms. According to the study by Ali, Narayan, and Sharma (2021), there are several reasons why students may face difficulties in engaging in web-based classes. These reasons include:

- *Lack of structure*: Online classes can be less structured than traditional classes. This lack of structure can make it harder for students to stay on track and keep up with their work.

- *Distractions:* With online classes, students are often working from home, which means they may be more easily distracted by things like social media, video games, or household chores.
- *Technical difficulties:* Technical issues such as slow internet speeds, computer problems, or software glitches can make it difficult for students to participate in online classes.
- *Lack of interaction:* Online classes can be isolating, especially if students are not able to interact with their peers and lecturers in real-time. This lack of interaction can make it harder for students to stay engaged and motivated.
- *Different learning styles:* Some students may find it difficult to learn effectively in an online environment, as it may not align with their preferred learning style.

Efforts can be made to enhance the online learning experience and encourage active participation through various means such as interactive discussions, designated Q&A sessions, and prompt feedback from lecturers.

5.5.9 Think Learn Zone helps me revise in places and time that is convenient for me

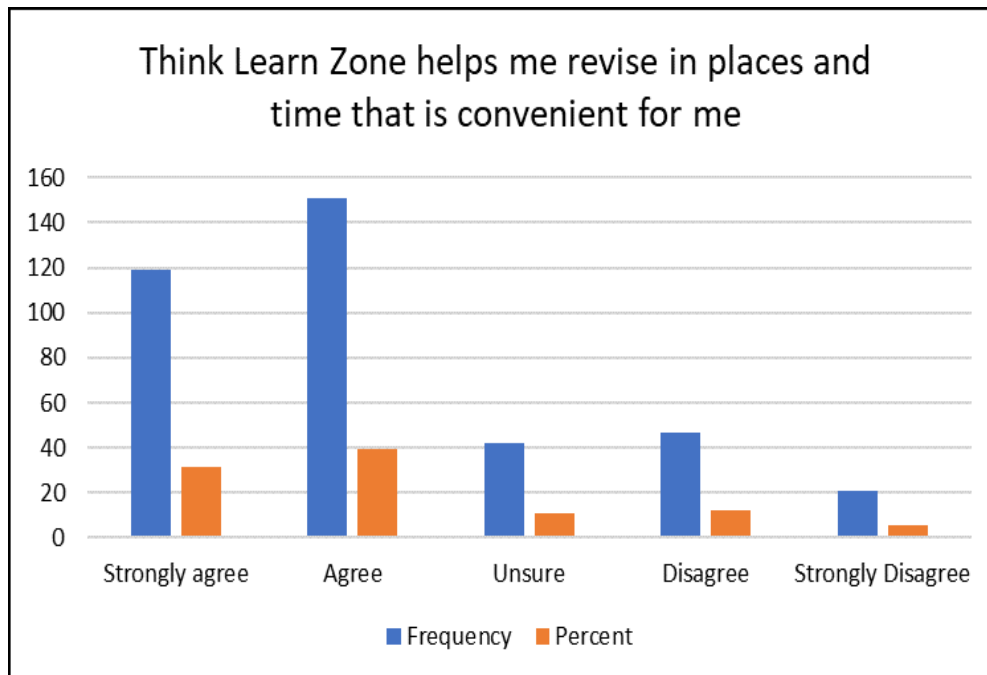


Figure 5.6: Think Learn Zone helps me revise in places and time that is convenient for me

The findings from Figure 5.6 suggest that a majority of respondents, 71%, agree that TLZ allows them to revise in convenient places and times. This indicates that TLZ provides flexibility for students to access course materials and engage in learning activities at their own preferred locations and schedules. It is worth noting that 18% of respondents expressed disagreement with the statement, while 11% were unsure.

The findings are consistent with the existing literature, which highlights the benefits of web-based learning platforms in terms of providing flexibility and accessibility. Web-based learning allows students to access learning materials and participate in discussions at their convenience, eliminating the constraints of physical classrooms and traditional schedules. This flexibility enables students to engage in learning activities in a manner that suits their individual preferences and lifestyles (Ayu, 2020).

5.5.10 Think Learn Zone helps students' study in convenient places and times distribution of respondents.

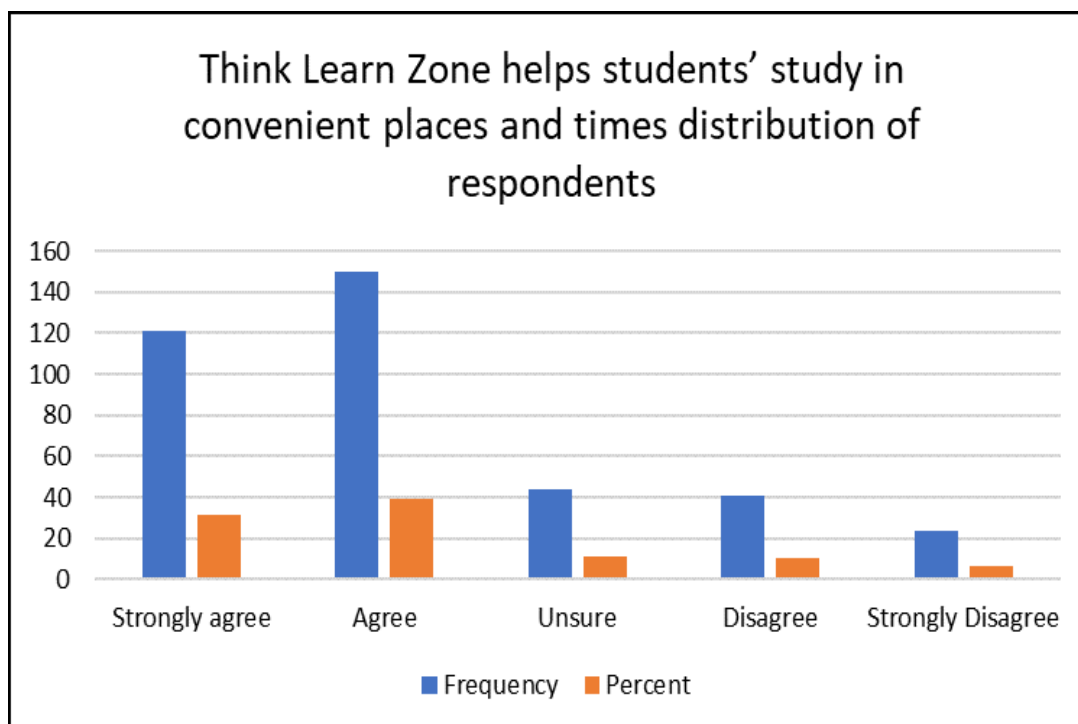


Figure 5.7: Think Learn Zone helps students' study in convenient places and times distribution of respondents

The findings from Figure 5.7 suggest that a majority of respondents, 71%, agree that TLZ allows them to study in convenient places and times. This indicates that TLZ provides flexibility for students to access the platform and engage in studying activities at their preferred locations and schedules. It is worth noting that 17% of respondents expressed disagreement with the statement, while 12% were unsure. The findings align with the existing literature, which highlights the advantages of web-based learning platforms in terms of flexibility and accessibility. Web-based learning enables students to study anywhere and at any time, if they have a reliable internet connection (Hasan et al., 2019). This flexibility is particularly beneficial for individuals who have other commitments, such as work or family responsibilities, and may not be able to attend traditional classes at set times.

5.5.11 Think Learn Zone helps me get in touch with students whose email address I don't have

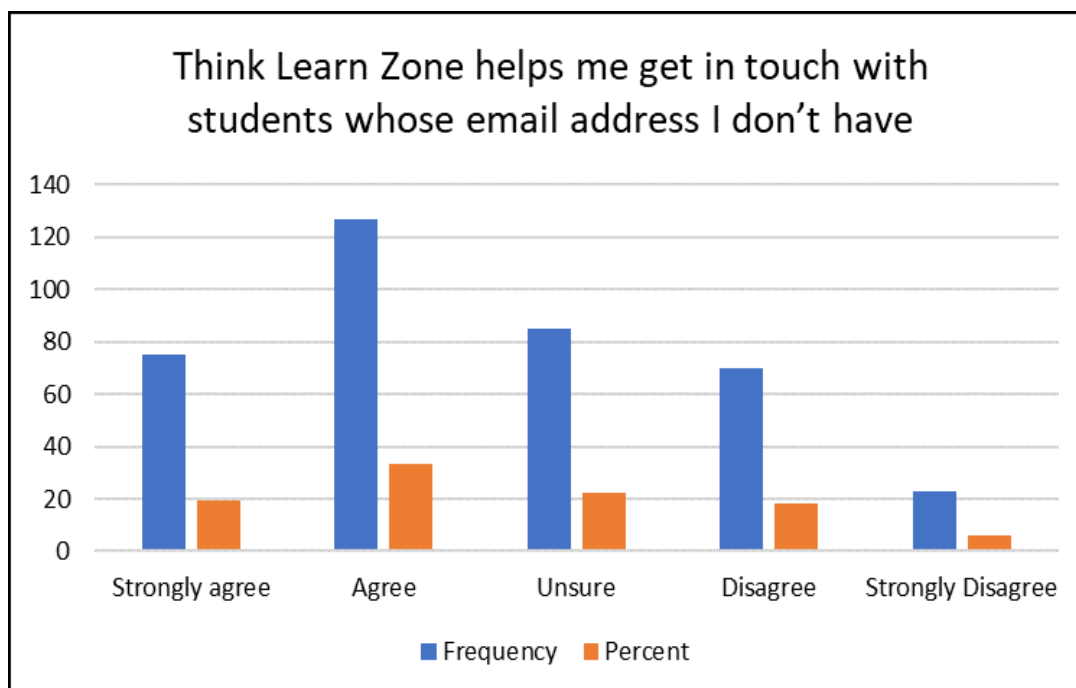


Figure 5.8: Think Learn Zone helps me get in touch with students whose email address I don't have

The findings from Figure 5.8 suggest that there is a mixed response regarding the effectiveness of TLZ in helping students get in touch with other students. While 33.4% of respondents agree that TLZ facilitates communication with peers, 46% disagree with the statement. Additionally, 22.4% of respondents were unsure about the platform's effectiveness in connecting students. These results indicate that there are challenges or difficulties experienced by a significant portion of the respondents when it comes to using TLZ as a means of communicating with their peers. It is important for the university to address these issues and explore different ways to ensure that TLZ is accessible and beneficial for all students.

Effective communication and collaboration among students are important aspects of the learning process, both in traditional classrooms and online environments. The university may need to provide additional support or resources to enhance the communication features of TLZ, such as encouraging students to actively participate in discussion forums, facilitating group projects, or promoting virtual meetings and

networking opportunities. By addressing the challenges and improving the communication functionalities of TLZ, the university can foster a more inclusive and collaborative online learning environment, enabling students to connect, engage, and learn from each other effectively.

5.5.12 Announcements in the Think Learn Zone enable me to plan my study time and how I spend my time on campus

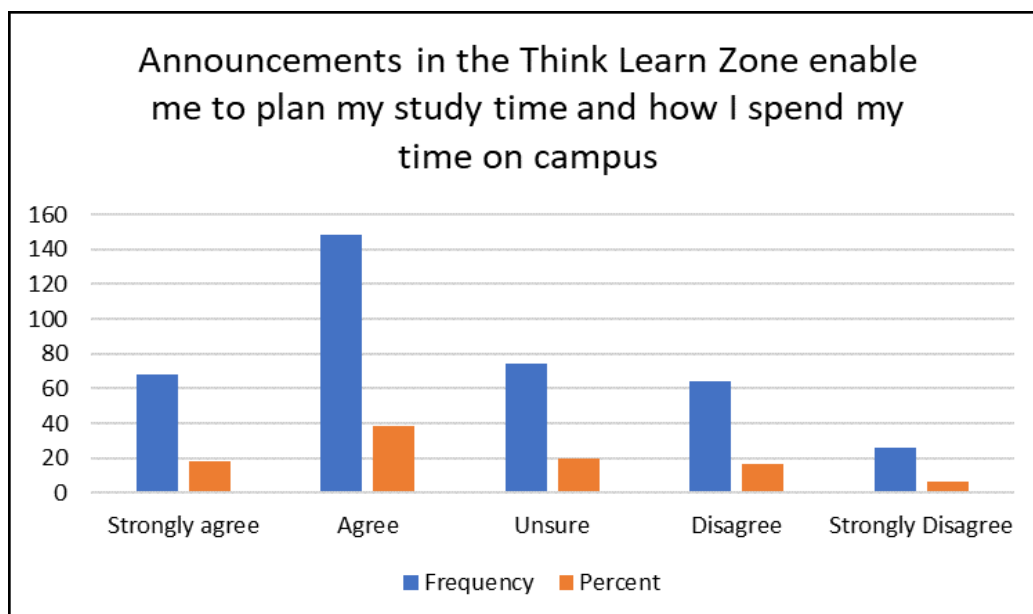


Figure 5.9: Announcements in the Think Learn Zone enable me to plan my study time and how I spend my time on campus

The findings from Figure 5.9 suggest that a majority of respondents, 57%, agree that announcements on TLZ enable them to plan their study time and allocate their time effectively. On the other hand, 26% of respondents disagreed with this statement, indicating that they may not find the announcements helpful in organising their study time. Additionally, 19% of respondents were unsure about the impact of announcements on their study planning. Effective time management is crucial for students to balance their academic responsibilities and other commitments. Announcements on TLZ can play a vital role in providing important information, updates, and reminders related to course materials, assignments, deadlines, and other relevant aspects of the learning process.

To further enhance the effectiveness of announcements in helping students plan their study time, DUT can consider the following measures:

- **Clear and timely communication:** Ensure that announcements are clear, concise, and provide relevant details. They should be communicated in a timely manner to allow students to plan ahead and allocate their study time effectively.
- **Organised and structured announcements:** Arrange announcements in a logical and organised manner, so students can easily locate and access the information they need. Categorising announcements based on subjects or topics can help students find specific information quickly.
- **Consistency in communication:** Maintain a consistent and regular schedule for posting announcements. This allows students to anticipate when new information will be shared and helps them plan their study time accordingly.
- **Interactive and engaging announcements:** Utilise multimedia elements such as videos, infographics, or interactive content to make announcements more engaging and visually appealing. This can capture students' attention and help them retain important information.
- **Feedback and assessment:** Encourage students to provide feedback on the usefulness and clarity of announcements. This feedback can help improve the quality and effectiveness of future announcements, ensuring they better serve students' needs in planning their study time.

By implementing these strategies, DUT can optimise the use of announcements on TLZ, making them a valuable tool for students in effectively planning their study time and managing their academic responsibilities.

5.6 LECTURERS' ASSISTANCE/ENGAGEMENT IN THINK LEARN ZONE PLATFORM

5.6.1 The lecturer helps to guide online discussions between students

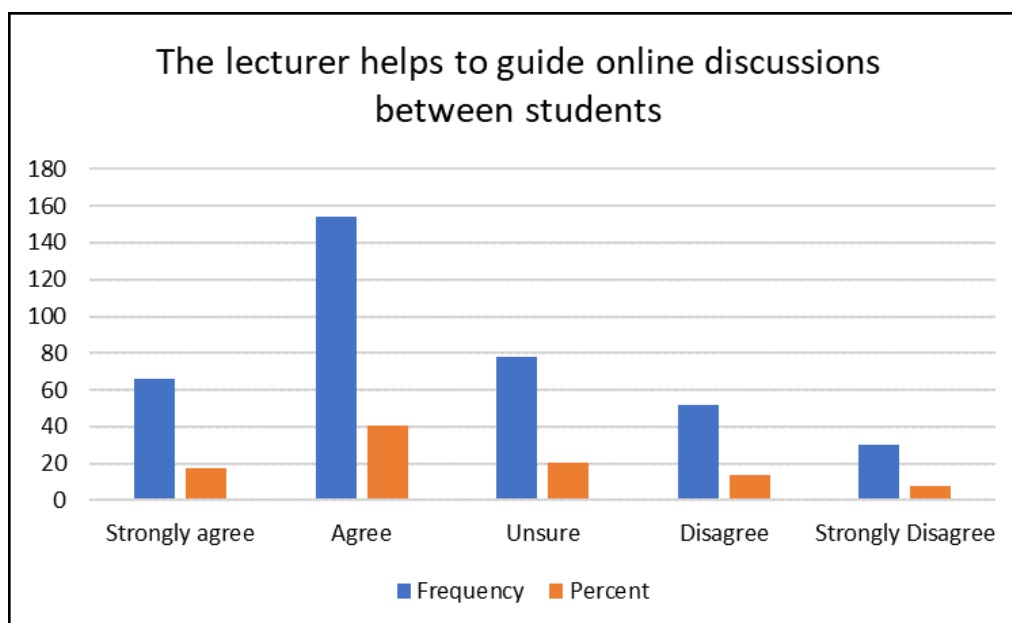


Figure 5.10: The lecturer helps to guide online discussions between students

According to Figure 5.10, a significant proportion of respondents, 40.5%, agree that lecturers assist in guiding online discussions between students. This indicates that lecturers are actively involved in facilitating and supporting interactions among students in the online learning environment. On the other hand, 22% of respondents disagree with this statement, suggesting that they may perceive a lack of guidance from lecturers in online discussions. Additionally, 20.5% of respondents were unsure about the extent of lecturers' involvement in guiding online discussions.

It is worth noting that the majority of respondents believe that lecturers are making efforts to facilitate student engagement and interaction in virtual classrooms. However, the absence of physical presence can present challenges for students in maintaining engagement and ensuring productive discussions. To address these challenges, lecturers can employ strategies to guide online discussions effectively. For instance, they can set clear discussion topics, provide prompts or questions to facilitate conversations, and actively participate in discussions to keep them focused and on-topic (Stone and Springer, 2019). By implementing such strategies, lecturers can

create an environment conducive to meaningful online discussions, fostering student engagement, collaboration, and critical thinking.

5.6.2 The lecturer's interactivity with students online encourages them to get the most out of my learning

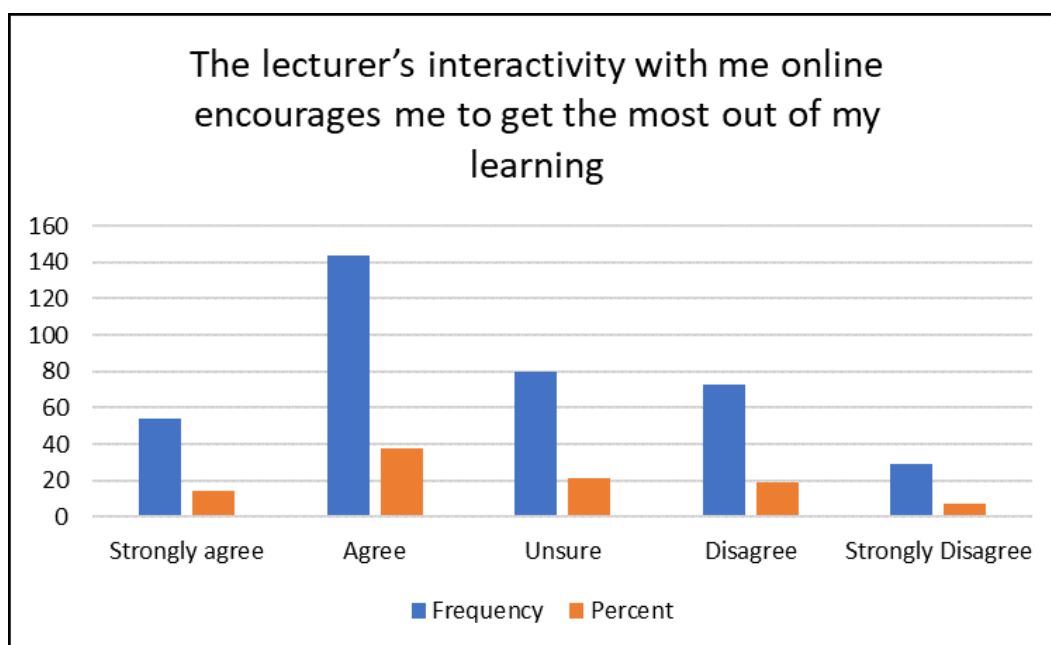


Figure 5.11: The lecturer's interactivity with students online encourages students to get the most out of their learning

Figure 5.11 reveals the lecturer's interactivity online distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 37.9%, followed by unsure category at 21.1%, disagree at 19.2%, strongly agree at 14.2% and strongly disagree at 7.6%. Findings indicate that 52% of the respondents agree that the lecturers' interactivity with students encourages them to get the most out of their learning, against 27% who disagree with this statement. The remaining 21% were unsure. Even though the majority of the respondents agree that lecturers encourage them in online classes, there is a percentage of students who do not concur with the statement. Literature indicates that it is the lecturer's duty to ensure that no student is left behind. Therefore, more attention needs to be paid to ensure that everyone is on the same path and no students are frustrated.

5.6.3 The lecturer helps to focus online discussions

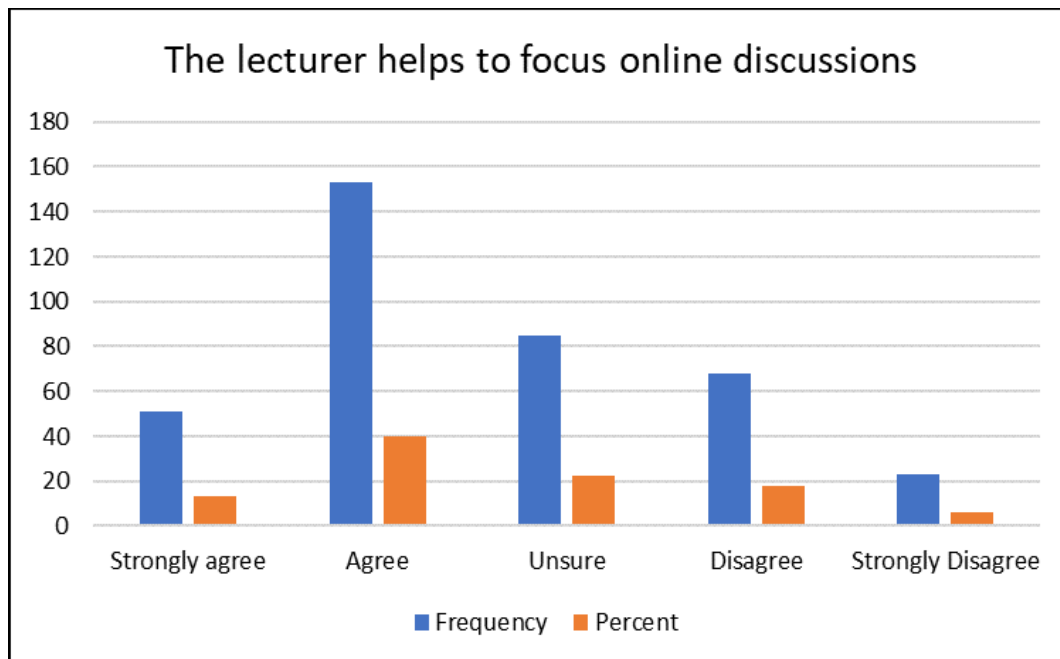


Figure 5.12: The lecturer helps to focus online discussions

Figure 5.12 reveals the lecturer's helps to focus online discussions distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 40.3%, followed by the unsure category at 22.4%, disagree at 17.9%, strongly agree at 13.4% and the strongly disagree at 6.1%. The results depicted in Figure 5.12, show that 53% of the respondents agree that lecturers help students to focus online discussions. In contrast, 25% of the respondents disagree. Responses that were unsure were at 22%. While findings show that majority of the respondents agree, attention should also be paid to those students that feel like they are not fully supported by lecturers. According to Martin, Wang and Sadaf (2020), lecturer motivation is essential to the success of online learning. An enthusiastic and motivated lecturer can create a positive learning environment that inspires students to learn and achieve their goals.

5.6.4 The lecturer's responses online motivate me to learn more deeply

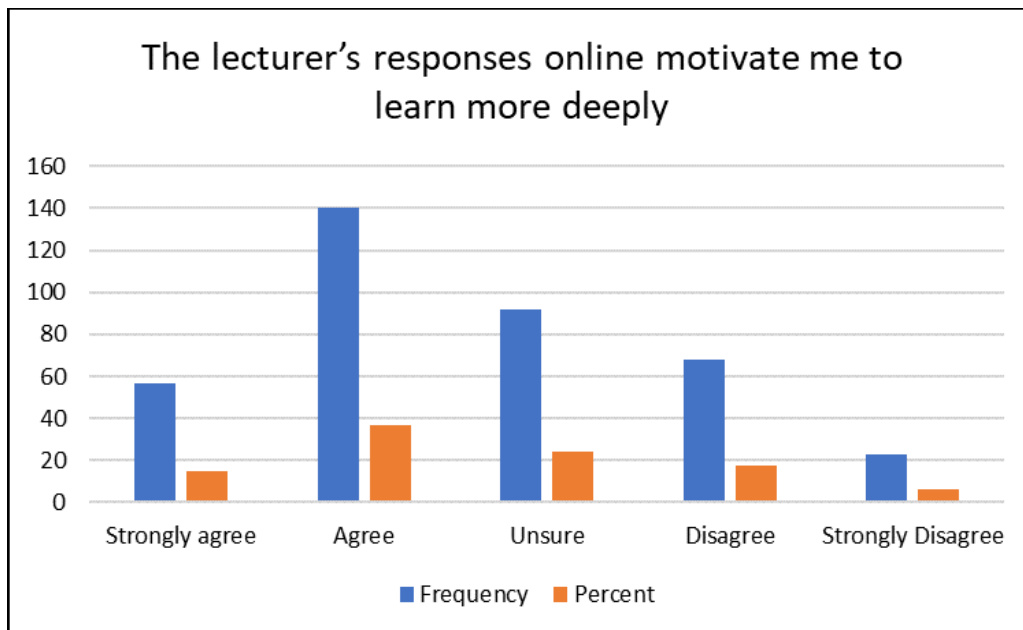


Figure 5.13: The lecturer's responses online motivate me to learn more deeply

Figure 5.13 reveals the lecturer's response online motivates students to learn distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 36.8%, followed by the unsure category at 24.2%, disagree at 17.9%, strongly agree at 15.0% and strongly disagree at 6.1%. The findings indicate that majority of the respondents agree that lecturers feedback motivates them to push hard and learn deeply. Literature indicates that giving feedback on students' progress motivates and supports them. According to Alawamleh, Al-Twait and Al-Saht (2020), lecturer feedback is an essential aspect of effective teaching and learning. Feedback is the process of providing information about an individual's performance in a specific area, and it plays a critical role in helping students learn and improve their skills.

5.6.5 Lecturers are always punctual and post weekly exercises on Think Learn Zone

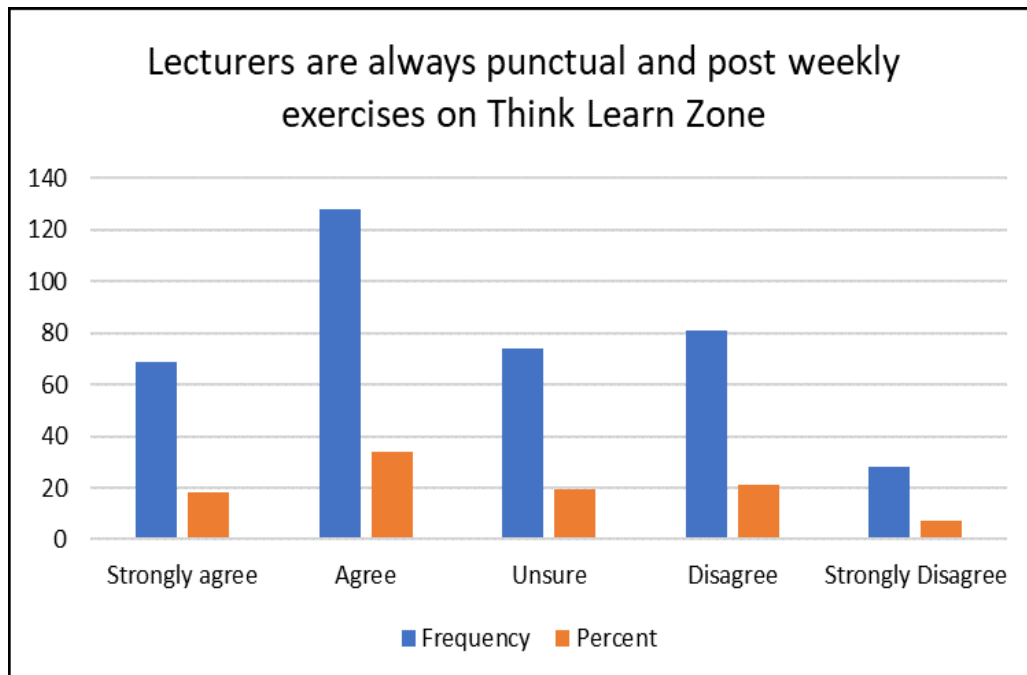


Figure 5.14: Lecturers are always punctual and post weekly exercises on Think Learn Zone

Figure 5.14 reveals whether the lecturers are always punctual and post weekly exercises distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 33.7%, followed by the unsure category at 21.3%, disagree at 19.5%, strongly agree at 18.2% and strongly disagree at 7.4%. Even though the majority of the respondents agree that lecturers are always punctual and post exercises weekly, some respondents do not agree with this statement which is a matter of concern as all lecturers are expected to be on time and be prepared for every session. The university may need to investigate this issue and ensure that all staff members are where they are when they are expected to be.

5.6.6 Lecturers get me to do my work and keep me motivated

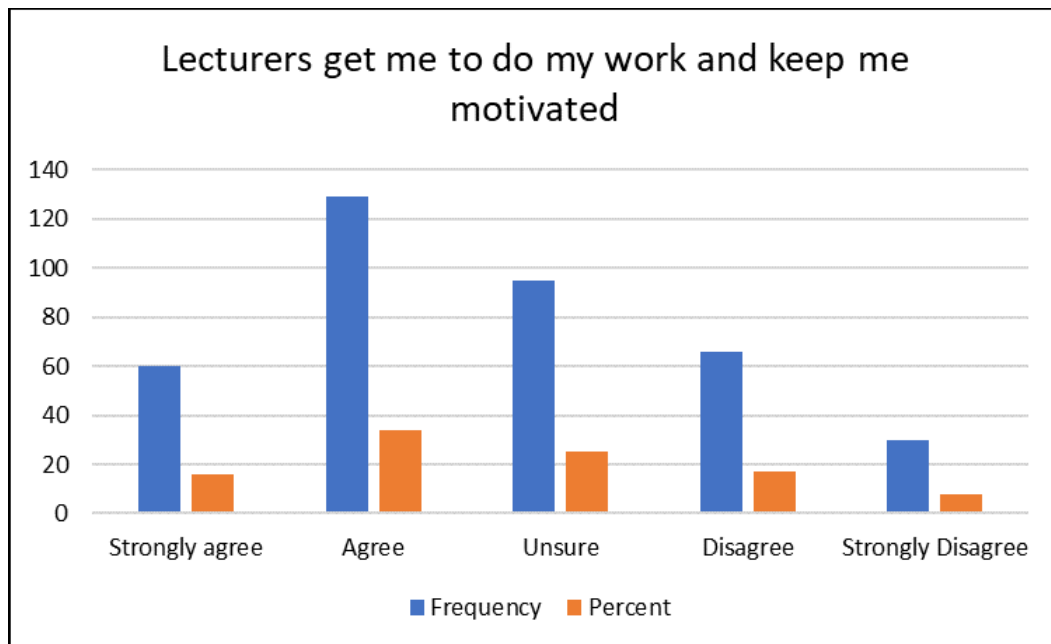


Figure 5.15: Lecturers get me to do my work and keep me motivated

Figure 5.15 reveals the lecturers get me to do my work and keep me motivated distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 33.9%, followed by the unsure category at 25.0%, disagree at 17.4%, strongly agree at 15.8% and strongly disagree at 7.9%. Lecturers should motivate students in online classes, just as they would in traditional in-person classes. Motivation is an essential component of the learning process, and it plays a significant role in helping students stay engaged, focused, and interested in the course material (Esra and Sevilen, 2021).

5.6.7 Lecturers give us daily tasks that keep us busy and ready for tests and exams

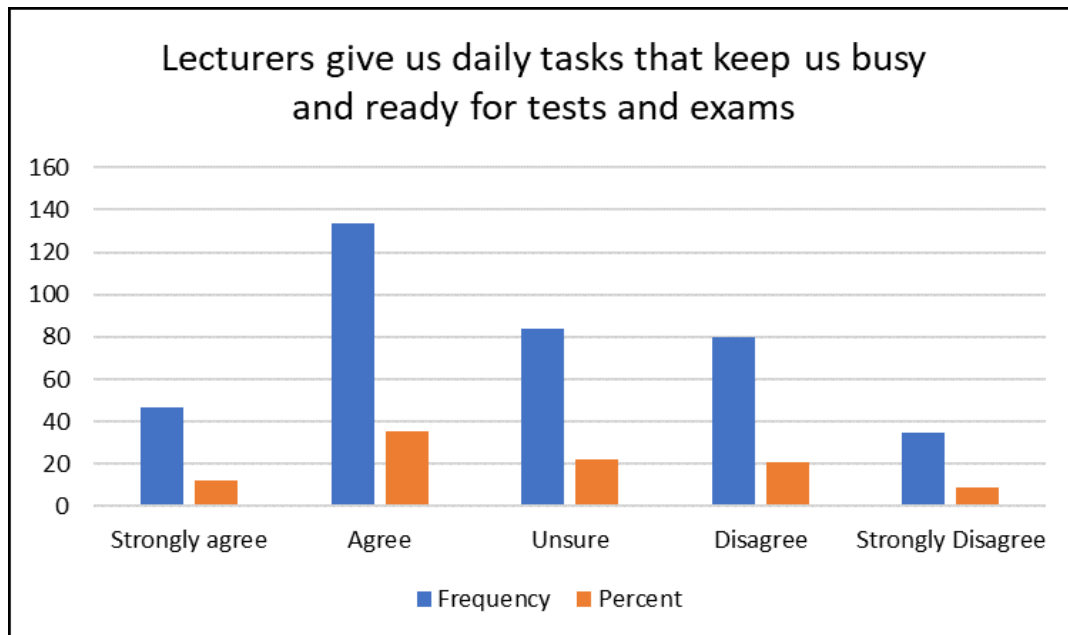


Figure 5.16: Lecturers give us daily tasks that keep us busy and ready for tests and exams

Figure 5.16 reveals the lecturers give daily tasks to keep students busy and ready for exams distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 35.3%, followed by the unsure category at 22.1%, disagree at 21.1%, strongly agree at 12.4% and strongly disagree at 9.2%. The results show that even though the majority of the respondents agree that lecturers give them daily tasks to keep them busy and ready for tests, a higher percentage of unsure and disagreeing students is reflected in the findings. The findings raise concern and may need to be investigated, because it is the lecturer's duty to assign tasks to students and ensure that they are ready for tests and exams.

5.6.8 Lecturers support me and contribute to how I perform in class

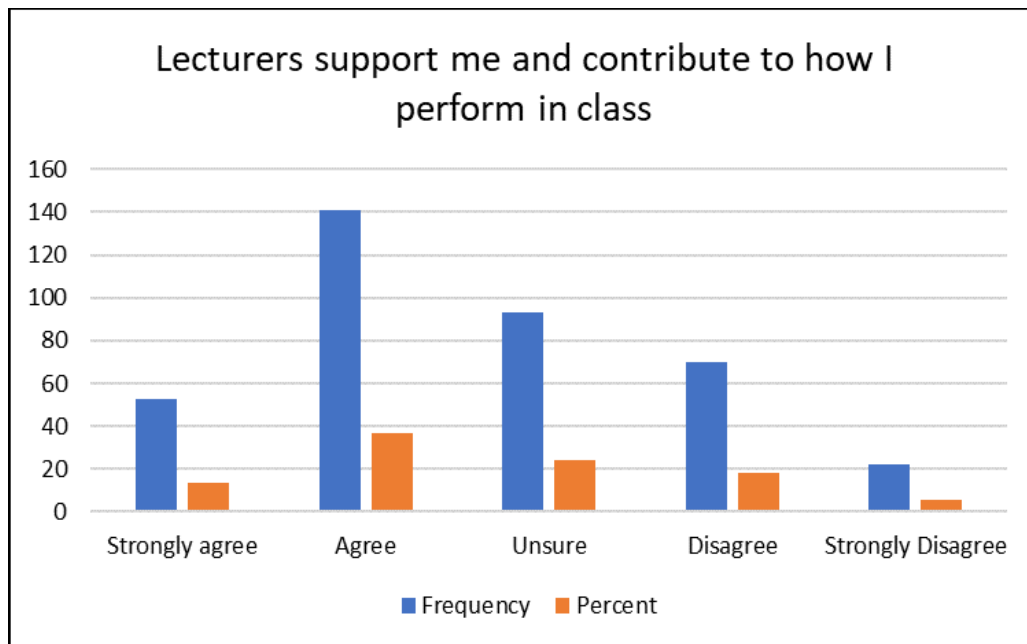


Figure 5.17: Lecturers support me and contribute to how I perform in class

Figure 5.17 reveals the lecturers support and contribution on how students perform in class distribution of respondents. The largest percentages of the respondents fell in the agree category with a high-level percentage of 37.1%, followed by the unsure category at 24.5%, disagree at 18.4%, strongly agree at 13.9%, strongly disagree at 7.9% and no response at 0.3%. Figure 5.17 indicates that while the majority of the respondents agree that lecturers support them and contribute to how they perform in class, a great number are unsure and disagree with this statement. Literature reveals that lecturers have a great impact on students overall perform. Their encouragement and support go a long way.

5.7 CORRELATION MATRIX

Table 5.8: Correlations (1)

		Activities on Think Learn Zone are designed to get the best out of students	The design of Think Learn Zone makes me want to explore the different ways to best use this tool
Activities on Think Learn Zone are designed to get the best out of students	Pearson Correlation	1	.547**
	Sig. (2-tailed)		< .001
	N	380	380
The design of Think Learn Zone makes me want to explore the different ways to best use this tool	Pearson Correlation	.547**	1
	Sig. (2-tailed)	< .001	
	N	380	380
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 5.8 shows that the correlation (r) between "activities on Think Learn Zone are designed to get the best out of students" and "the design of Think Learn Zone makes me want to explore the different ways to best use this tool" is .547. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is a statistically significant relationship between these variables ($r = .547$, $p < 0.01$).

Table 5.9: Correlations (2)

		Notes and other materials on Think Learn Zone help me understand the lectures and topics that I find hard	Lecture notes and slides available on the Think Learn Zone help me revise after lectures
Notes and other materials on Think Learn Zone help me understand lectures and topics that I find hard	Pearson Correlation	1	.693**
	Sig. (2-tailed)		< .001
	N	380	380

Lecture notes and slides available on the Think Learn Zone help me revise after lectures	Pearson Correlation	.693**	1
	Sig. (2-tailed)	<.001	
	N	380	380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "notes and other materials on Think Learn Zone help me understand lectures and topics that I find hard" and "lecture notes and slides available on the Think Learn Zone help me revise after lectures" is .693. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r=.693$, $p<0.01$).

Table 5.10: Correlations (3)

	Think Learn Zone helps me catch up on the lectures that I have missed in class	Think Learn Zone is a useful mean of contacting staff members
Think Learn Zone helps me catch up on the lectures that I have missed in class	Pearson Correlation Sig. (2-tailed) N	1 .547** <.001 380 380
Think Learn Zone is a useful mean of contacting staff members	Pearson Correlation Sig. (2-tailed) N	.547** 1 <.001 380 380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "Think Learn Zone helps me catch up on the lectures that I have missed in class" and "Think Learn Zone is a useful mean of contacting staff members" is .547. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .693$, $p < .01$).

Table 5.11: Correlations (4)

	Think Learn Zone helps me catch up on the lectures that I have missed in class	Think Learn Zone serves as backup for materials and handouts that were given in class
Think Learn Zone helps me catch up on the lectures that I have missed in class	1	.589**
	Pearson Correlation	
	Sig. (2-tailed)	<,001
	N	380
Think Learn Zone serves as backup for materials and handouts that were given in class	.589**	1
	Pearson Correlation	
	Sig. (2-tailed)	<,001
	N	380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "Think Learn Zone helps me catch up on the lectures that I have missed in class" and "Think Learn Zone serves as backup for materials and handouts that were given in class" is .589. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables. ($r = .589$, $p < 0.01$).

Table 5.12: Correlations (5)

	Think Learn Zone helps me catch up on the lectures that I have missed in class	Think Learn Zone enables me to ask questions that I normally find it hard to ask in class.
Think Learn Zone helps me catch up on the lectures that I have missed in class	1	.454**
	Pearson Correlation	
	Sig. (2-tailed)	<,001
	N	380
Think Learn Zone enables me to ask questions that I normally find it hard to ask in class.	.454**	1
	Pearson Correlation	
	Sig. (2-tailed)	<,001
	N	380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "Think Learn Zone helps me catch up on the lectures that I have missed in class" and "Think Learn Zone enables me to ask questions that I normally find it hard to ask in class" is .454. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .454$, $p < 0.01$).

Table 5.13: Correlations (6)

	Think Learn Zone helps me revise in places and time that is convenient for me	Think Learn Zone helps me study in places and time that is convenient for me
Think Learn Zone helps me revise in places and time that is convenient for me	1	.803**
Pearson Correlation		<,001
Sig. (2-tailed)		
N	380	380
Think Learn Zone helps me study in places and time that is convenient for me	0.803**	1
Pearson Correlation		
Sig. (2-tailed)	<,001	
N	380	380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "Think Learn Zone helps me revise in places and time that is convenient for me" and "Think Learn Zone helps me study in places and time that is convenient for me" is 0.803. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = 0.803$, $p < 0.01$).

Table 5.14: Correlations (7)

	Think Learn Zone helps me get in touch with students whose email address I don't have	Announcement in the Think Learn Zone enable me to plan my study time and how I spend my time on campus
Think Learn Zone helps me get in touch with students whose email address I don't have	Pearson Correlation 1	.632**
	Sig. (2-tailed)	<,001
	N	380
Announcements in the Think Learn Zone enable me to plan my study time and how I spend my time on campus	Pearson Correlation .632**	1
	Sig. (2-tailed)	<,001
	N	380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "Think Learn Zone helps me get in touch with students whose email address I don't have" and "announcements in the Think Learn Zone enable me to plan my study time and how I spend my time on campus" is .632. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .632$, $p < 0.01$).

Table 5.15: Correlations (8)

	The lecturer helps to guide online discussions between students	The lecturer helps to focus online discussions
The lecturer helps to guide online discussions between students	Pearson Correlation 1	.640**
	Sig. (2-tailed)	<,001
	N	380
The lecturer helps to focus online discussions	Pearson Correlation .640**	1

Sig. (2-tailed)	<,001	
N	380	380

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "the lecturer helps to guide online discussions between students" and "the lecturer helps to focus online discussions" is .640. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .640$, $p < 0.01$).

Table 5.16: Correlations (9)

		The lecturer's interactivity with me online encourages me to get the most out of my learning	The lecturer's responses online motivate me to learn more deeply
The lecturer's interactivity with me online encourages me to get the most out of my learning	Pearson Correlation	1	.702**
	Sig. (2-tailed)		<,001
	N	380	380
The lecturer's responses online motivate me to learn more deeply	Pearson Correlation	.702**	1
	Sig. (2-tailed)	<,001	
	N	380	380

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "the lecturer's interactivity with me online encourages me to get the most out of my learning" and "the lecturer's responses online motivate me to learn more deeply" is .702. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .702$, $p < 0.01$).

Table 5.17: Correlations (10)

		Lecturers are always punctual and post weekly exercises on Think Learn Zone.	Lecturers give us daily tasks that keep us busy and ready for tests and exams
Lecturers are always punctual and post weekly exercises on Think Learn Zone.	Pearson Correlation	1	.590**
	Sig. (2-tailed)		<,001
	N	380	380
Lecturers give us daily tasks that keep us busy and ready for tests and exams	Pearson Correlation	.590**	1
	Sig. (2-tailed)	<,001	
	N	380	380

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "lecturers are always punctual and post weekly exercises on Think Learn Zone" and "lecturers give us daily tasks that keep us busy and ready for tests and exams" is .590. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .590$, $p < 0.01$).

Table 5.18: Correlations (11)

		Lecturers get me to do my work and keep me motivated	Lecturers support me and contribute to how I perform in class
Lecturers get me to do my work and keep me motivated	Pearson Correlation	1	.703**
	Sig. (2-tailed)		<,001
	N	380	379
Lecturers support me and contribute to how I perform in class	Pearson Correlation	.703**	1
	Sig. (2-tailed)	<,001	
	N	379	379

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation (r) between "lecturers get me to do my work and keep me motivated" and "lecturers support me and contribute to how I perform in class" is .703. This coefficient shows that there is a strong and positive relationship between these two variables. The probability (p) of this correlation coefficient is 0.01 which is less than 0.05 thus implying that there is statistically significant relationship between these variables ($r = .703, p < 0.01$).

5.8 CHALLENGES ASSOCIATED WITH WEB-BASED LEARNING

The last part of the questionnaire consisted of four open-ended questions, which required respondents to identify any challenges that they encounter in online classrooms. The following major challenges were identified:

- **Poor network connection**

Students identified poor network connectivity as a major challenge. They indicated that it is always a challenge to attend online classes and finish assignments as connectivity is bad due to the load shedding that South Africa is currently facing. They also indicated that data given by the university is not sufficient and does not allow them enough time online to attend all lectures they have to so they end up missing some lectures.

- **Interruption from students**

Respondents indicated that it is difficult to concentrate in classes as some students are very rude and interruptive, for instance, some students turn on their microphones while the lecturer was giving a lecture. Some would go on to mute everyone, including the lecturer and remove them from the lecture.

- **Infrastructure limitations**

Another challenge students identified is limited infrastructure. Some students indicated that they do not have laptops to attend online classes and do assignments. They work on their phones and that is very difficult as some features do not appear on phones.

- **Lack of training**

Another challenge identified by students is that of training. They have indicated that they were not fully trained and are not sure how to use some of the TLZ and MS Teams features and this results in disruptions in classes.

The second question asked students to indicate what efforts were made by the lecturers and faculty to resolve their challenges.

- **Record classes**

Lecturers record classes so that students can catch up on the missed lectures due to network connectivity and lack of data.

- **Create WhatsApp groups**

Students indicated that some lecturers created WhatsApp groups for ease of communication with students. They indicated that lecturers also send notes for easy accessibility.

Thirdly, students were asked to indicate how online learning affected their school workload. They indicated that online learning has affected their workload tremendously as there is too much to be done and caught up due to missed classes because of bad network connection. They stated that they struggle with time management and that there is very little to no resting time at all.

Lastly, respondents were asked if they are confident and satisfied with TLZ as a tool of learning. The responses indicated that most are satisfied, however, proper training should be conducted to ensure that everyone knows what is expected from them and how they should behave in online classes because some students mute and exit others out of classes because they are not familiar with the functionalities of the LMS.

5.9 ACADEMIC STAFF – INTERVIEWS

The researcher conducted semi-structured interviews with lecturers who expressed their availability and willingness to participate. The researcher recognised the importance of gathering insights from academic staff across all faculties to gain a

comprehensive understanding of the impact of web-based learning on their workload and their strategies for motivating and engaging students in online classes. Ideally, the researcher aimed to interview at least one lecturer from each department. However, due to the busy schedules of the lecturers, only ten were available and agreed to participate in the study. While this number may be smaller than initially anticipated, it can still provide valuable insights into the experiences and perspectives of the interviewed lecturers.

Semi-structured interviews allow for flexibility in the questioning process, enabling the participants to share their thoughts and experiences in a more open-ended manner. The researcher prepared a list of nine questions to guide the discussion during these interviews. These questions revolved around topics such as the impact of web-based learning on workload, strategies for student motivation and engagement in online classes, and any challenges or successes encountered in the transition to online teaching. The findings from these interviews can contribute to a deeper understanding of the experiences and perspectives of academic staff in relation to web-based learning and inform recommendations for improving online teaching practices. The pseudonyms P01 – P10 were used to represent the participants interviewed.

The subheadings below follow the sequence of the questions in the interview schedule (Appendix E).

5.9.1 How has the teaching online experience been for you?

Most of the respondents expressed that the experience of teaching online was not an easy one because the shift from traditional face-to-face teaching to online teaching happened very abruptly. The excerpts from participants indicate that teaching and learning online is a challenging undertaking.

The shift was very challenging as it happened very quickly, and training was provided in a very short period. (P10)

The experience to be very challenging and new because the university was using Blackboard so when COVID-19 hit, we migrated to Moodle and had to get training during a pandemic. (P02)

The experience was good because with everything in life, there is a positive and a negative, so there were challenges but there's also been good experiences. (P05)

Participants explained that teaching online during a pandemic with a new LMS was challenging, however, training was conducted which made the process to easy and effective.

5.9.2 Has the university provided sufficient resources and support to ensure that the teaching and learning process runs smoothly in online teaching?

The responses to this question were very positive. The answers were as follows:

The university provided laptops and data to lecturers as well as students. (P02)

Laptops and Wi-Fi routers were given to all staff members in our department and training was conducted to ensure that the process runs smoothly. (P06)

Yes, the university gave me laptop, data, and conducted training. (P08)

Even though the university provided resources, I think they did not provide enough support as trainings were conducted during the day while classes were going on. (P10)

The supporting excerpts indicated that sufficient support was given to lecturers as well as students to ensure that the teaching and learning process runs smoothly. Academic staff members were given laptops and data by the university.

5.9.3 What kinds of preparation are necessary to teach online?

The responses were similar:

Preparation is similar to a face-to-face lecture. You need to be prepared and well researched about the topic you are going to cover. (P01)

Ensure that the session is interactive, because you want to ensure that students engage during the lecture. (P05)

Be creative. Make use of pictures and videos to ensure that the interesting yet informative. (P03, P07)

Be familiar with the platform that you are using. (P02)

Excerpts indicated that the same preparation needed for a traditional face-to-face class is also needed for an online class. Lecturers need to be prepared and know about the content that will be delivered. Lecturers also need to ensure that students participate in class, so the session should be fun yet informative. Another lecturer noted that it is very important to be creative and incorporate the use of pictures and videos when teaching, because some students are not the same. Some learn visually so using videos can do a lot for them.

5.9.4 What challenges have you encountered teaching online?

Responses expressed by the respondents were similar to an extent: The responses provided were as follows:

My biggest challenge was the students' attendance. It was very low. (P03)

The challenge that I encountered the most was attendance. I have a large class, however, not even half the students attended classes. (P01 and P09)

Attendance and engagement were my two biggest challenges. There were only a few individuals who attended classes all the time as well as a number of faces that participated in all sessions. Everyone else was just silent as if they logged into the class and continued with their thing on the side. (P05)

Supporting excerpts indicated that challenges experienced in online classes include very poor attendance and very little participation. One lecturer indicated that she would ask students if they understood but would get no response in return. Respondents expressed that attendance was a challenge because most students expressed that they did not have sufficient data to log on to the classes so most of them would depend on the recordings.

5.9.5 How do you get students to do the work and keep them motivated and engage in classes?

Respondents provided similar answers to this question. The answers were as follows:

We do activities and quizzes that help keep them engaged and motivated. (P01)

I allow my students to bring in any real-life situation in the classroom and I have picked up that most students would relate to those scenarios. That made the learning process a lot easier for them. (P08)

I ensure that I provide feedback to all students and allow them to collaborate. (P05).

I make sure that I record all my sessions so that everyone can come back and catch up. I also have one-on-one sessions. (P07)

I set clear expectations where I communicate the course objectives, assignments, and grading criteria to students at the beginning of the course. (P04)

Excerpts related to the above question indicated that lecturers go out of their way to assist students who are struggling. Classes were recorded and WhatsApp groups were created for ease of communication between the lecturer and students. One responded that she also has one on one sessions with her students, and she has learned that some students are facing real life challenges and require patience and empathy.

5.9.6 How has online teaching affected your administrative workload?

All respondents said that their workload increased. Responses provided were as follows:

The administrative duties were impacted very negatively because I literally had to do things double than I would in a traditional face-to-face class. (P07)

My administrative duties increased to 100. Getting hold of students that are left behind to contacting students that are registered but have never done any assignment. It was a lot. (P05)

There is a lot of administration that can be avoided. If marks from Moodle were automatically captured in to the ITS. (P010)

Students have the misconception that with online learning, lecturers are available 24/7. Some students will call on MS Teams during the night. (P01.

Excerpts revealed that the administrative workload was negatively impacted in online learning setups. Respondents expressed that administration is doubled in online classes and there is a lot of following up with students that needs to be done. Also, students expect lecturers to be available all the time and some would call in during the late hours of the night. Some would send a message on Teams and as well as an email. Lecturers are expected to respond to all messages, and some would be a repetition.

5.9.7 How have you been assisting students that were left behind to catch up?

This question queried how lecturers go about assisting students that are left behind. The explanations provided were as follows:

I send out an email to all students who have missed any assignment. (P10)

I sent out emails and called students on MS Teams. If I can't reach them on Teams, I try their cellphone numbers. (P02)

I go the extra mile and make time for students who are struggling. Even if it means staying up at night. That is how passionate I am about my work and student motivation. (P04)

I contact students individually and prepare special make-up tests and assignments. (P03)

These excerpts indicated that all respondents called and sent out emails to all students who were left behind. Everyone said that they made sure that no student was left behind.

5.9.8 Are you satisfied and confident with think learn zone as a tool of teaching and learning?

Responses to this question were positive. All respondents expressed their satisfaction with TLZ as a tool of teaching and learning. Responses were as follows:

Yes, now I am confident and satisfied. There have been a lot of improvements and proper trainings. (P08)

Yes, I am very satisfied. (P03)

LMSs change all the time and can never be 100% perfect, but I am happy with what we have now. (P05)

Yes, I am comfortable with the platform now. I have had to put in a lot of time trying to figure it out. (P01)

Yes, especially with all the training conducted. (P09)

Excerpts to this question were very positive. All respondents expressed their satisfaction and confidence with TLZ as a teaching tool. They have added that they are also happy with MS Teams. With times changing, LMSs likewise change, so everyone is happy with what they have for now and will be open to changing should there be any requirements to change.

The last question was open for respondents to express any additional information or comments they have that will contribute to the effectiveness of online learning. The question was phrased as follows:

5.9.9 Do you have any additional information that you would like to add that will contribute to the effectiveness of online learning?

I think online learning is a good method of instruction, however, I believe that face-to-face learning is a better method in terms of engagement. There has been challenges with online learning and that frustrates the students. Lecturers should be open-minded and creative. They also need to bear in mind that students are not the same and should not be treated the same. (P03)

I think online learning is a system that can work if implemented and used properly. The university needs to consider students' issues and ensure that they are resolved. (P08)

There are a lot of things that need to be considered for online to be effective. Data provided to students needs to be relooked at and should be sufficient. Another issue is ensuring that all students are provided with resources to attend online classes because the truth of the matter is that some students are disadvantaged. (P010)

Excerpts from the respondents were very positive and will contribute greatly to the effectiveness of web-based teaching and learning. Responses from participants noted different ways to ensure that this mode of instruction is not frustrating to the users and is effective.

5.10 INTERVIEW REPORTS

Academic staff interviews

Ten lecturers participated in semi-structured interviews as part of the study. The interview consisted of nine items that revolved around key themes related to online teaching experience, available resources and support, preparation for online teaching, challenges faced while teaching online, student motivation, and the administrative workload associated with online teaching. The purpose of the interview was to gather insights and perspectives from the lecturers on these various aspects of online teaching and learning.

5.10.1 Online teaching experience

The following findings noted lecturers' experience with online teaching:

- The majority of the respondents indicated that transitioning from traditional face-to-face to web-based teaching and learning was very challenging because initially, the university was using Blackboard, however, when COVID-19 hit, the university shifted to Moodle. According to the respondents, the shift came with a lot of challenges which required a lot of training.
- One of the respondents indicated that her experience teaching online was a very smooth one, because she was already familiar with Moodle.

5.10.2 Resources and support

All the respondents indicated that the university supported their online teaching experience and provided sufficient resources to ensure that the teaching process ran

smoothly. Lecturers were given laptops to work on and were also provided with Wi-Fi routers.

5.10.3 Challenges encountered in online teaching

The following challenges were listed by lecturers:

- All respondents indicated that they struggled immensely with student attendance. They indicated that not even half of their students showed up in their online classes.
- Respondents revealed that student engagement was also a great challenge as only a few students participated and engaged in class. The others were online but they would not engage even when asked if they understood a certain thing.

5.10.4 Preparation for online class

The following findings were noted regarding preparing for an online class:

- Familiarise yourself with the technology: The respondents noted that it is important to make sure that you understand how to use the online platform that will be used for the class.
- Prepare materials: The majority of the respondents indicated that lecturers must create visual aids, such as PowerPoint presentations and videos that they plan to use during the class. It was also noted that lecturers should ensure that those materials are accessible to all students and compatible with the online platform.

5.10.5 Student engagement and motivation

The following responses were elicited in response to the question of how respondents' motivate and encourage engagement in online classes:

- Set clear expectations: Respondents indicated that they clearly communicate the course objectives, assignments, and grading criteria to students at the beginning of the course. This helps students understand what is expected of them and gives them a sense of direction.
- Provide regular feedback: The majority of the respondents stated that they provide timely and constructive feedback on student work as this can help students stay motivated and engaged. Additionally, it gives them a sense of progress and helps them improve their performance.
- Encourage collaboration: Respondents indicated that they encourage group projects and collaborative learning activities as this helps students feel connected to their peers and creates a sense of community in the online class.
- Create an engaging course design: The majority of the respondents indicated that they use multimedia, interactive activities, and discussion forums to create an engaging learning experience. This can help students stay interested in the course content and participate actively in class discussions.

5.10.6 Administrative workload

Respondents were asked to express how online learning affected their administrative workload. They stated the following:

- All respondents indicated that online teaching affected their administrative workload immensely. They indicated that everything doubled and was done twice compared to how it was in a traditional face-to-face classroom.

5.11 SUMMARY

The purpose of this chapter was to provide a thorough analysis, interpretation, and discussion of the data collected from both students and lecturers. The chapter began by presenting descriptive statistics, which were visually represented through graphs and tables. To ensure a comprehensive interpretation, the data analysis was also

linked to relevant literature that had been discussed in earlier chapters. The overall findings suggest that the activities within the web-based LMS at DUT are effectively managed. This indicates that the institution has implemented appropriate measures to facilitate web-based teaching and learning. Additionally, the analysis identified various challenges faced by both students and lecturers in the context of web-based education. Furthermore, the findings from the interviews conducted with academic staff indicated that lecturers are providing support and motivation to students in web-based classrooms. These efforts are reported to have a direct correlation with students' academic performance. However, a notable concern highlighted by the findings was the issue of student engagement. It suggests that there is room for improvement in enhancing student engagement in the web-based learning environment.

By examining the data from both students and lecturers, this chapter provides a comprehensive understanding of the state of web-based teaching and learning at DUT. The findings shed light on the effective management of activities in the web-based LMS, as well as the challenges faced by students and lecturers. The interviews with academic staff also contribute valuable insights into the support and motivation provided to students, while highlighting the importance of addressing the issue of student engagement in the web-based classroom setting.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The aim of this study was to understand and conceptualise the management of activities linked to web-based learning system at the DUT. The study utilised secondary data obtained through an extensive literature search, and primary data collected through an empirical study. The primary data was carefully evaluated to identify any significant correlations between the variables under investigation. This chapter presents the conclusions drawn from the study, summarises the findings and provides evidence that the objectives of the study have been achieved. It outlines the limitations encountered during the research process and offers recommendations to address those limitations in future studies. Additionally, this chapter identifies potential areas for future research that can build upon the findings and fill any gaps in knowledge or understanding.

6.2 SUMMARY OF THE STUDY

This section of the study presents the summary of the study while investigating the management of activities linked with a web-based Learning Management System.

Chapter 1: This chapter introduced the aim, objectives, and research question formulated to address the objectives, emphasising the study's significance.

Chapter 2: In this chapter, an extensive literature survey was conducted to examine the utilisation of technology in education, considering both global and South African perspectives. The literature review encompassed the significance and application of technology in higher education, specifically focusing on the scope and variety of web-based learning approaches.

Chapter 3: This chapter covered the important theoretical concepts that serve as the study's framework.

Chapter 4: This chapter provided detailed information about the research strategy and methodology employed in the study.

Chapter 5: This chapter provided a thorough analysis, interpretation, and discussion of the data collected from both students and lecturers.

6.3 OBJECTIVES OF THE STUDY

The objectives of the study as expressed in the introduction to the study were:

- To determine the effectiveness of web-based teaching and learning.
- To identify challenges associated with web-based teaching and learning.
- To examine the correlation between academic assistance/engagement and students' performance.
- To develop a framework that can provide practical strategies for overcoming web-based teaching and learning challenges.

6.4 SUMMARY OF FINDINGS – STUDENT QUESTIONNAIRES

The study's results are summarised in this section. The results of the students' questionnaire are explained in the first section, while the lecturers' interview is covered in the second.

6.4.1 To determine the effectiveness of web-based teaching and learning

The following findings were revealed regarding the effectiveness of web-based learning.

6.4.1.1 Access to learning material

The respondents indicated that TLZ offers access to learning materials posted by the lecturers as well as additional learning notes that are easily accessible, ensuring knowledge and facilitation of communication through information exchange.

6.4.1.2 Flexibility

According to the respondents, web-based learning provides students with multidimensional tools and a comfortable and adaptable learning environment.

6.4.1.3 Increased collaboration

Respondents revealed that TLZ facilitates collaboration between students and teachers, through online forums, discussion groups, and other interactive tools.

6.4.1.4 Interactive and engaging content

The respondents indicated that TLZ platform incorporates multimedia content, such as videos, animations, and simulations, which make learning more engaging and interactive. Students indicated that this also helps them retain information more effectively.

6.4.2 To identify challenges associated with web-based teaching and learning

The major findings of the study identified several challenges associated with web-based learning:

6.4.2.1 Poor network connectivity

According to the respondents, poor network connectivity emerged as a significant challenge in their online teaching and learning experiences. They highlighted that attending online classes and completing assignments were difficult due to the problem of bad connectivity. This issue was attributed to load shedding, which is currently a prevalent issue in South Africa. Additionally, the respondents expressed dissatisfaction with the amount of data provided by the university. They felt that the allocated data

was insufficient and did not last long enough for them to attend all their lectures. As a result, they faced difficulties in accessing the necessary online resources and attending all the required online sessions, leading to missed lectures.

6.4.2.2 Interruption from students

Most of the respondents indicated that it is difficult to concentrate in classes as some students are very rude and interruptive. Students would turn on their microphones while the lecturer was giving a lecture. Some would go on to mute everyone, including the lecturer, and remove them from the lecture.

6.4.2.3 Infrastructure limitations

Additionally, respondents identified that limited infrastructure is another challenge faced by students. Students indicated that they do not have laptops to attend online classes and do assignments. They work on their phones and that is very difficult as some features do not appear on phones.

6.4.2.4 Lack of training

Another challenge identified by students is that of training. They have indicated that they were not fully trained and are not sure how to use some of the TLZ and MS Teams features and that results in disruptions in classes.

6.4.3 To examine the correlation between academic assistance/engagement and students' performance

The following findings were revealed regarding the correlation between academic assistance/engagement and students' performance:

6.4.3.1 Improved student motivation and engagement

The majority of the respondents indicated that when lecturers engage with them, they are better able to be motivated and inspired to learn deeply.

6.4.3.2 Enhanced learning outcomes

The respondents revealed that lecturers' feedback motivates them to push hard and learn deeply. Additionally, they indicated that lecturer feedback is an essential aspect of effective teaching and learning.

6.4.3.3 Facilitating online discussions

The respondents indicated that lecturers encourage them to engage in online discussions and facilitate discussions by posting thought-provoking questions and encouraging them to respond to one another's ideas. In addition, they revealed that lecturers also provide feedback and guide discussions to ensure that they stay on track and achieve their learning objectives.

6.5 SUMMARY OF FINDINGS – ACADEMIC STAFF INTERVIEWS

As part of the study, ten lecturers participated in interviews to gather insights and perspectives on various aspects of online teaching and learning. The interview consisted of nine items or questions that focused on key themes relevant to the topic. These themes included the lecturers' experiences with online teaching, the resources and support available to them, their preparation for online teaching, challenges encountered while teaching online, student motivation, and the administrative workload associated with online teaching. The purpose of conducting these interviews was to gain a deeper understanding of the lecturers' experiences and perspectives in relation to online teaching. By exploring these key themes, the researcher aimed to gather valuable insights on the effectiveness of online teaching methods, the support systems in place, and the challenges faced by lecturers. The interviews provided an opportunity for the lecturers to share their experiences, perspectives, and suggestions related to online teaching and learning.

6.5.1.1 Online teaching experience

The following findings noted lecturers' experience with online teaching:

- According to the majority of respondents, the transition from traditional face-to-face teaching to web-based teaching and learning was found to be highly challenging. Initially, the university was using Blackboard as the LMS, but when the COVID-19 pandemic emerged, the university shifted to Moodle, a different LMS. This shift presented significant challenges for the respondents, as it required them to adapt to a new platform and undergo extensive training to effectively utilise Moodle for online teaching.
- One of the respondents expressed that her experience teaching online was very smooth, mainly due to her prior familiarity with the Moodle learning management system. This familiarity with the platform played a significant role in facilitating a seamless transition to online teaching for this respondent.

6.5.1.2 Resources and support

All the respondents indicated that the university supported their online teaching experience and provided sufficient resources to ensure that the teaching process ran smoothly. Lecturers were given laptops to work on and were also provided with Wi-Fi routers.

6.5.1.3 Challenges uncouneted in online teaching

The following challenges were listed by lecturers:

- According to all the respondents, they encountered significant challenges regarding student attendance in their online classes. They expressed that less than half of their students attended the online sessions, indicating a considerable reduction in student participation compared to traditional face-to-face classes. The struggle with student attendance in online classes could be attributed to several factors. The transition to online learning due to the COVID-19 pandemic brought about various disruptions and changes in students' lives. They may have faced difficulties in adjusting to the new learning environment, managing technological requirements, or dealing with personal circumstances that affected their ability to attend classes regularly.

- The respondents indicated that student engagement posed a significant challenge in their online classes. They expressed that only a small number of students actively participated and engaged during the sessions, while the majority remained passive and did not engage even when prompted or asked if they understood certain concepts.

6.5.1.4 Preparation for online class

The following findings were noted regarding preparing for an online class:

- **Familiarise yourself with the technology:** The respondents noted that it is important to make sure that you understand how to use the online platform that will be used for the class. This recommendation highlights the importance of educators gaining proficiency in the specific technology or LMS that will be utilised for online teaching. By becoming familiar with the online platform, educators can effectively navigate its features, tools, and functionalities. This knowledge enables them to plan and deliver their online classes more efficiently and with greater confidence. Educators who are well-versed in the technology are better equipped to troubleshoot issues, provide technical assistance to students, and optimise the platform's capabilities to enhance the learning experience.
- **Prepare materials:** The majority of the respondents indicated that lecturers must create visual aids, such as PowerPoint presentations and videos that they plan to use during the class. It was also noted that lecturers should ensure that those materials are accessible to all students and compatible with the online platform.

6.5.1.5 Student engagement and motivation

Lecturers listed the following when asked how they motivate and encourage engagement in online classes:

- **Set clear expectations:** Respondents indicated that they clearly communicate the course objectives, assignments, and grading criteria to students at the

beginning of the course. This helps students understand what is expected of them and gives them a sense of direction.

- **Provide regular feedback:** The majority of the respondents stated that they provide timely and constructive feedback on student work as this can help students stay motivated and engaged. Additionally, it gives them a sense of progress and helps them to improve their performance.
- **Encourage collaboration:** Respondents indicated that they encourage group projects and collaborative learning activities as this helps students feel connected to their peers and create a sense of community in the online class.
- **Create an engaging course design:** The majority of the respondents indicated that they use multimedia, interactive activities, and discussion forums to create an engaging learning experience. This can help students stay interested in the course content and participate actively in class discussions.

6.5.1.6 Administrative workload

Respondents were asked to express how online learning affected their administrative workload.

All respondents indicated that online teaching affected their administrative workload immensely. They indicated that everything doubled and was done twice compared to how it was in a traditional face-to-face classroom.

6.6 CONCLUSIONS BASED ON OBJECTIVES

The following conclusions are drawn in accordance with the study's objectives.

Objective 1: To determine the effectiveness of web-based teaching and learning.

The study's findings highlighted the benefits of web-based learning, particularly in terms of flexibility and accessibility for students. Web-based learning allows students

to engage in education in a manner that aligns with their individual needs and circumstances. This flexibility enables students to have greater control over their learning because they can access course materials and participate in activities at their own pace and convenience. Furthermore, the study concluded that web-based learning offers interactive and engaging content. The incorporation of multimedia elements, such as videos, animations, and simulations, enhances the learning experience by making it more interactive and captivating. This multimedia approach not only captures students' attention but also facilitates better understanding and retention of information. By presenting information in a visually appealing and interactive manner, web-based learning provides students with a more immersive and effective learning environment.

Objective 2: To identify challenges associated with web-based teaching and learning.

The following conclusions may be drawn on the challenges of learning with technology as revealed by the findings:

- Inadequate equipment, a shortage of Wi-Fi, bandwidth, and data, and a lack of technical assistance have an impact on the delivery of curricula and hinder the e-learning process;
- Interruption from students: It is difficult to concentrate in classes as some students are very rude and interruptive. Students turn on their microphones while the lecturer is giving a lecture. Some go on to mute everyone, including the lecturer and remove them from the lecture;
- Lack of support and training: Web-based learning can be a solitary experience, and many students struggle without the support and guidance of teachers or peers. This is particularly true for students who are used to more traditional classroom settings.

- Power outages: South Africa is known for experiencing frequent power outages, which can disrupt online learning and make it difficult for students to complete coursework.

Objective 3: To examine the correlation between academic assistance/engagement and students' performance.

The findings of the study indicate that providing lecturer assistance and fostering engagement positively influences student motivation and engagement. This, in turn, results in improved learning outcomes and contributes significantly to students' overall performance. Additionally, the facilitation of online discussions was found to be a valuable factor in enhancing student engagement and promoting effective learning. The active involvement of lecturers in guiding and supporting students throughout the online learning process plays a crucial role in creating a conducive and interactive learning environment. These findings highlight the importance of lecturer involvement and engagement in promoting student success in web-based teaching and learning contexts.

6.7 RECOMMENDATIONS

The recommendations of this study, arising from the empirical findings of the investigation, are presented below:

1. Provide accessible and engaging content: It's crucial to adopt inclusive design principles, making course materials suitable for learners with disabilities or those accessing content from different devices or locations. This involves employing clear fonts, readable text sizes, and well-contrasted color schemes to enhance visibility. Alt texts and detailed descriptions for images, along with captions and transcripts for multimedia, are essential components for accommodating learners with visual and hearing impairments. Responsive design ensures adaptability to various screen sizes and devices. Additionally, a multifaceted approach is necessary. Diversifying content through the integration of multimedia elements, such as videos, audio clips, images, and infographics, caters to different learning preferences and maintains learner interest. Interactive assessments, quizzes,

and assignments promote active participation and gauge understanding effectively. Discussion forums encourage learner interaction, fostering a collaborative learning environment where ideas and perspectives can be exchanged. Incorporating gamification elements, such as badges or rewards, adds an enjoyable aspect to the learning journey, motivating learners to progress. Relating course content to real-world applications provides context, illustrating the practical implications of theoretical concepts.

2. Encourage collaboration and communication: Lecturers play a central role in creating opportunities for student engagement through various means, one of which is the establishment of discussion forums. These forums provide a platform for students to express their thoughts, share insights, and engage in meaningful discourse related to course topics. By actively participating in discussions, students not only deepen their understanding of the subject matter but also benefit from diverse perspectives and experiences brought forth by their peers. In addition to discussion forums, group projects present another avenue for collaborative learning. Assigning tasks that require teamwork not only cultivates a sense of community among students but also improves crucial skills such as communication, cooperation, and problem-solving. These collaborative efforts allow students to tap into the collective knowledge and strengths of the group, providing a richer learning experience than individual efforts alone. Lecturers can facilitate communication channels within these groups, ensuring effective coordination and information exchange among team members.

Moreover, embracing various communication tools, such as video conferencing, messaging platforms, and collaborative document editing, further enhances the online learning environment. Live virtual sessions enable real-time interaction, mimicking the face-to-face engagement found in traditional classrooms. Utilising messaging platforms fosters ongoing communication, facilitating quick queries and discussions. Collaborative document editing platforms promote shared workspaces, encouraging students to collectively contribute to projects and assignments.

3. Interactive content: Lecturers should provide interactive content that engages students and helps them retain information. This should include multimedia content, quizzes, and simulations. Multimedia content, encompassing videos, audio clips, images, and interactive presentations, serves as a powerful tool to capture students' attention and cater to diverse learning styles. By presenting information in a visually appealing and dynamic manner, lecturers can create a more immersive learning experience. This approach not only stimulates interest but also aids in comprehension and retention, as students are more likely to remember information delivered through engaging multimedia formats.

Additionally, incorporating quizzes into the curriculum offers an interactive assessment method that not only measures students' understanding but also reinforces key concepts. These quizzes can be strategically placed throughout the course, prompting students to actively recall and apply knowledge. The interactive nature of quizzes promotes a sense of participation and self-assessment, contributing to a more dynamic learning process.

4. Monitor student progress: The regular monitoring of student progress is an essential practice for lecturers engaged in web-based teaching and learning. This proactive approach serves as a valuable tool for identifying areas where students may encounter difficulties and allows lecturers to offer timely and targeted support. By consistently tracking student performance, lecturers can gain insights into individual learning journeys and intervene when necessary to ensure optimal comprehension and academic success. Various methods can be employed for monitoring student progress in the online learning environment. These include analysing assessment results, tracking participation in discussion forums, and evaluating the completion of assignments. Assessments, whether quizzes, exams, or project submissions, provide quantitative data that can highlight areas of strength and weakness. Monitoring discussion forum participation offers qualitative insights into students' comprehension and engagement with the course content, while assignment completion rates can indicate the level of understanding and commitment.

The information gathered through progress monitoring enables lecturers to identify struggling students early in the learning process. Lecturers can then tailor their support strategies based on individual needs, providing additional resources, clarifications, or personalised guidance. This intervention is particularly valuable in preventing potential challenges from escalating, fostering a supportive learning environment where students feel acknowledged and empowered to overcome obstacles.

5. **Provide technical support:** Technical support plays a pivotal role in mitigating and resolving issues that may arise during online education, ranging from platform access problems to connectivity issues and software glitches. The availability of responsive technical support contributes significantly to minimising disruptions in the learning process, allowing both lecturers and students to focus on the educational content rather than grappling with technical obstacles. To implement effective technical support, DUT should establish a user-friendly and easily accessible support system. This system should include a dedicated helpdesk, online chat support, email assistance, or a hotline, ensuring that users can seek help through various channels based on their preferences and the urgency of the issue.

The technical support team should be well-versed in addressing common problems related to TLZ. They should provide step-by-step guidance for problem resolution, troubleshoot technical issues efficiently, and offer clear instructions to users who may be less familiar with the digital platforms. Furthermore, regular communication and updates regarding system maintenance, upgrades, or known issues can also enhance the user experience. This transparency allows lecturers and students to stay informed about the status of the online learning environment and better prepares them for any potential disruptions.

6. **Design user-friendly interface:** Designing a user-friendly interface for TLZ is paramount to ensuring a positive and effective web-based teaching and learning experience. The user interface should prioritise ease of use and navigation,

providing clear instructions and intuitive features that enhance accessibility and usability for both lecturers and students.

7. **Resources:** DUT should proactively allocate sufficient data resources to students, recognising that access to online learning hinges on reliable and consistent internet connectivity. This involves assessing the data requirements of various online activities, including attending virtual classes, accessing learning materials, and participating in discussions. Offering data packages or subsidies can alleviate the financial burden on students and promote inclusivity. Additionally, ensuring strong Wi-Fi connectivity is essential for creating an inclusive online learning environment. DUT should invest in robust network infrastructure to provide reliable internet access for all students, irrespective of their geographical location. This includes both on-campus and off-campus areas, acknowledging that students may be accessing online resources from diverse environments.

6.8 ATTAINMENT OF OBJECTIVES

1. To determine the effectiveness of web-based teaching and learning

The literature reviewed in Chapter 2 discusses in detail the importance of technology in education and the advantages of implementing technology in education, especially in higher education. The findings of this study further indicates that users regard web-based learning to be effective.

2. To identify challenges associated with web-based teaching and learning

The findings of this empirical study indicated the various challenges as experienced by lecturers and students in using web-based teaching and learning technologies at DUT.

3. To examine the correlation between academic assistance/engagement and students' performance

The findings of this empirical study indicated the correlation between academic assistance and students' performance.

4. To develop a framework that can provide practical strategies for overcoming web-based teaching and learning challenges.

The achievement of this objective is discussed below.

Figure 6.1 illustrates a framework devised by the researcher, offering practical strategies to overcome challenges in web-based teaching and learning. On the left side of the figure, various challenges are depicted, encompassing issues like inadequate literacy skills, difficulty understanding course material, lack of technology and internet access, limited student engagement and interaction, and insufficient student support. Conversely, the right side of the figure outlines corresponding intervention strategies aimed at addressing the aforementioned challenges. These interventions involve enhancing digital literacy, delivering learning materials in multiple languages, equipping students with functional devices, incorporating interactive and captivating online learning tools such as quizzes, games, and simulations, and providing additional support to students grappling with web-based learning.

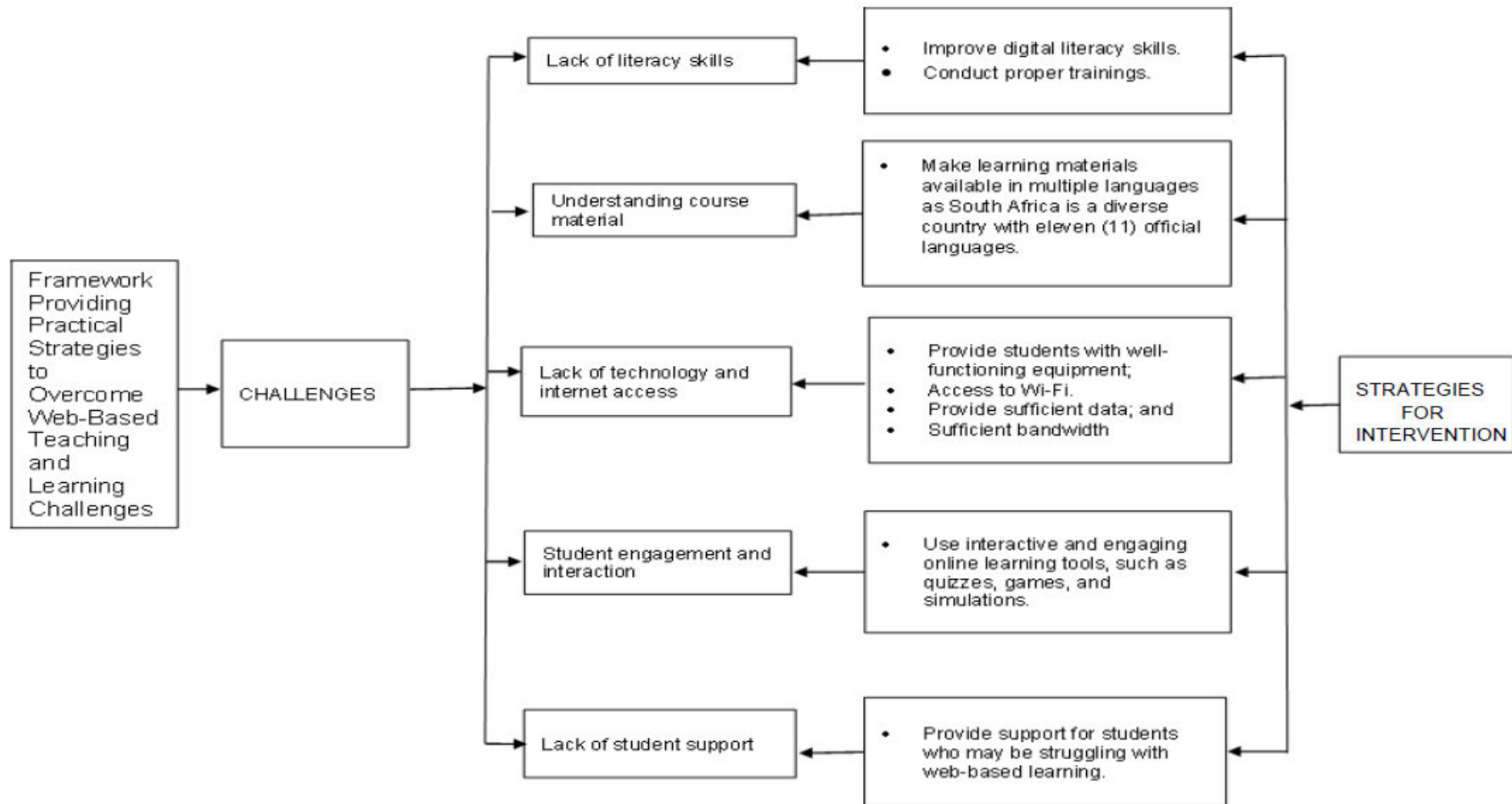


Figure 6.1: Framework providing practical strategies to overcome web-based challenges

6.9 LIMITATIONS OF THE STUDY

The Covid-19 pandemic's effects are the study's main source of limitations. The initial study survey was planned to be administered physically to participants by the researcher. However, the lockdown of the university meant that the participants could only engage online. Consequently, the researcher had to contact participants via email. The survey had to be transformed into an online survey, which the researcher then sent to students via a link in an email.

The sample of the study only included DUT, hence the conclusions and following recommendations cannot not be generalised and applied to other universities. However, the results can be used to enhance the effectiveness of web-based teaching and learning for all users.

6.10 SUGGESTIONS FOR FURTHER RESEARCH

This study focused on the management of activities in web-based LMS at the DUT; the following recommendations are proffered for further research:

1. Evaluate different pedagogical approaches and instructional strategies that can enhance student engagement, motivation, and learning outcomes in the online learning environment.
2. Examine the role of technological support and infrastructure in facilitating successful online learning experiences.
3. Investigate the impact of online learning on equity and inclusion, particularly in relation to students from diverse backgrounds, students with disabilities, or those facing socioeconomic challenges.
4. Examine the impact of professional development programmes and support mechanisms for educators transitioning to online teaching.

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APPENDICES

APPENDIX A: PERMISSION TO CONDUCT STUDY AT DUT



*Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732948*

12th November 2021
Ms Mbalenhle Khumalo
c/o Department of Business and Information Management
Faculty of Accounting and Informatics
Durban University of Technology

Dear Ms Khumalo

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Full Permission** for you to conduct your research "A critical examination of the management of administrative activities linked with web-based learning management system at the Durban University of Technology" at the Durban University of Technology.

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

DR LINDA ZIKHONA LINGANISO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

APPENDIX B: LETTER OF INFORMATION



LETTER OF INFORMATION

Title of the Research Study: Management of web-based learning system at the Durban University of Technology.

Principal Investigator/s/researcher: Mbalenhle Khumalo: Doctor of Philosophy in Business and Information Management

Co-Investigator/s/supervisor/s: Dr T Ramsuraj

Brief Introduction and Purpose of the Study:

Good Day,

I hope you are well and safe.

I am a PhD candidate at the Durban University of Technology conducting research for a Doctor of Philosophy in Business and Information Management. I would like to invite you to participate in the research.

Your contribution is greatly appreciated.

Outline of the Procedures: The main aim was to understand and conceptualise the management of web-based learning system at the Durban University of Technology.

The research objectives are:

- To determine the effectiveness of web-based teaching and learning.
- To identify challenges associated with web-based teaching and learning.
- To examine the correlation between academic assistance/engagement and students' performance.
- To develop a framework that can provide practical strategies for overcoming web-based teaching and learning challenges.

Self-administered questionnaire and semi-structured interviews will be used to collect data. An email requesting to conduct interviews will be sent out to academics and if the current pandemic is still affecting us then the interviews will be conducted on MS Teams. Data collected will be used for research purposes only. The target population of the study are academics and students from the Durban University of Technology (DUT).

Risks or Discomforts to the Participant: You will not be exposed to any risks since you will only be filling in the questionnaire and answering research interview questions. The study contributes to knowledge production and the findings will be published in accredited publications.

Explain to the participant the reasons he/she may be withdraw from the Study:

Participation is voluntary, you may withdraw at any time.

Benefits: There will be no monetary incentives and participation in study is voluntary. Likewise, there will be no charge for participating in the study.

Remuneration: You will not receive any remuneration for participating in this study.

Costs of the Study: No costs will be expected to be covered in the study.

Confidentiality: Confidentiality will be maintained and responses will be kept in a closed access. Your identity will not be revealed.

Results: Thesis will be available in DUT library and journal publications will be available online.

Research-related Injury: You will not be exposed to any risks as you will only be filling in the questionnaire and answering research interview questions. The research does not involve anything that could affect your well-being.

Storage of all electronic and hard copies including tape recordings: Data will be obtained and stored for five years in the Department of Information and Corporate Management. Hard copies will be disposed after five years, but electronic copies will be available online.

Persons to contact in the Event of Any Problems or Queries: For more information, please contact the researcher on 079 633 1490, my supervisor on 031 373 5660 or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.



CONSENT

Full Title of the Study: Management of web-based learning system at the Durban University of Technology.

Names of Researcher/s: Mbalenhle Khumalo

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Mbalenhle Khumalo about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 103/16,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant Thumbprint	Date	Time	Signature / Right

I, Mbalenhle Khumalo herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	
Full Name of Researcher	Date	Signature

_____	_____	_____
Full Name of Witness (If applicable)	Date	Signature

_____	_____	_____
Full Name of Legal Guardian (If applicable)	Date	Signature

Please note the following:

Research details must be provided in a clear, simple and culturally appropriate manner and prospective participants should be helped to arrive at an informed decision by use of appropriate language (grade 10 level- use Flesch Reading Ease Scores on Microsoft Word), selecting of a non-threatening environment for interaction and the availability of peer counselling (Department of Health, 2004).

If the potential participant is unable to read/illiterate, then a right thumb print is required and an impartial witness, who is literate and knows the participant e.g. parent, sibling, friend, pastor, etc. should verify in writing, duly signed that informed verbal consent was obtained (Department of Health, 2004).

If anyone makes a mistake completing this document e.g. a wrong date or spelling mistake, a new document has to be completed. The incomplete original document has to be kept in the participant's file and not thrown away, and copies thereof must be issued to the participant.

References:

Department of Health: 2004. *Ethics in Health Research: Principles, Structures and Processes* <http://www.doh.gov.za/docs/factsheets/guidelines/ethnics/>

Department of Health. 2006. *South African Good Clinical Practice Guidelines*. 2nd Ed. Available at: http://www.nhrec.org.za/?page_id=14

APPENDIX C: ETHICAL CLEARANCE LETTER



Faculty Research Office
Durban University of Technology
9 July 2021

Student: Mbalenhle Marcia Khumalo
Student Number: 21322895
Degree: PhD in Business and Information Management
Email: 21322895@dut4life.ac.za
Supervisor: Dr K S Ngwane
Supervisor email: nqwaneks@dut.ac.za

Dear Ms Khumalo

ETHICAL APPROVAL: LEVEL 2

I am pleased to inform you that the Faculty Research Ethics Committee (FREC) following feedback from two reviewers, has granted preliminary permission for you to conduct your research 'A critical examination of the management of administrative activities linked with web-based learning management system at the Durban University of Technology'.

When ethics approval is granted:

You are required to present the letter at your research site(s) for permission to gather data. Please also note that your research instruments must be accompanied by the letter of information and the letter of consent for each participant, as per your research proposal.

This ethics clearance is valid from the date of provisional approval on this letter for one year. A student must apply for recertification 3 months before the date of this expiry. Recertification is required every year until after corrections are made, after examination, and the thesis is submitted to the Faculty Registrar.

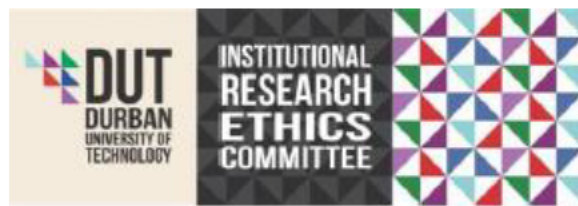
A summary of your key research findings must be submitted to the FRC on completion of your studies.

Kindest regards,

Yours sincerely

Dr Mogiveny Rajkoomar
FREC Chair
Faculty of Accounting and Informatics
Durban University of Technology
Ritson Campus
Durban, South Africa
4001

APPENDIX D: QUESTIONNAIRE



STUDENTS' QUESTIONNAIRE

SECTION A – PERSONAL DETAILS

Please mark with an X on the appropriate box:

1.1	Gender	
	• Male	
	• Female	
	• Other	
1.2	Race	
	• Black	
	• White	
	• Coloured	
	• Asian	
1.3	Age	
	• 21 - 23	
	• 24 - 26	
	• 27 - 30	
	• Above 30	

SECTION B – ANALYSIS

ACTIVITIES INVOLVED WITH THINK LEARN ZONE

Please indicate your level of agreement in the following statements:

STATEMENTS	Strongly agree	Agree	Unsure	Disagree	Strongly Disagree
2.1 Activities on Think Learn Zone are designed to get the best out of students.					
2.2 Lecture notes and slides available on Think Learn Zone help my complete the notes I took in class.					
2.3 Notes and other materials on Think Learn Zone help me understand lectures and topics that I find hard.					
2.4 Think Learn Zone helps me catch up on the lectures that I have missed in class					
2.5 Lecture notes and slides available on the Think Learn Zone help me revise after lectures.					
2.6 Think Learn Zone is a useful mean of contacting staff members.					
2.7 The design of Think Learn Zone makes me want to explore the different ways to best use this tool.					
2.8 Think Learn Zone serves as backup for materials and handouts that were given in class.					

2.9 Think Learn Zone enables me to ask questions that I normally find it hard to ask in class.					
2.10 Think Learn Zone helps me revise in places and time that is convenient for me.					
2.11 Think Learn Zone helps me study in places and time that is convenient for me					
2.12 Think Learn Zone helps me get in touch with students whose email address I don't have					
2.13 Announcements in the Think Learn Zone enable me to plan my study time and how I spend my time on campus					

ACADEMICS ASSISTANCE/ENGAGEMENT IN THINK LEARN ZONE PLATFORM

Please indicate your level of agreement in the following statements:

STATEMENTS	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
3.1 The lecturer helps to guide online discussions between students.					
3.2 The lecturer's interactivity with me online encourages me to get the most out of my learning.					
3.3 The lecturer helps to focus online discussions.					
3.4 The lecturer's responses online motivate me to learn more deeply.					
3.5 Lecturers are always punctual and post weekly exercises on Think Learn Zone.					
3.6 Lecturers get me to do my work and keep me motivated.					
3.7 Lecturers give us daily tasks that keep us busy and ready for tests and exams.					
3.8 Lecturers support me and contribute to how I perform in class.					

SECTION C

CHALLENGES ASSOCIATED WITH WEB-BASED LEARNING

1. What type of challenges do you encounter in your online programmes?
2. What efforts are made by the lecturers and faculty to resolve the challenges?
3. How has online learning affected your school workload?
4. Are you confident and satisfied with Think Learn Zone as a tool of learning?

APPENDIX E: INTERVIEW SCHEDULE



LECTURERS' INTERVIEW SCHEDULE

Questions:

1. How has the teaching online experience been for you?
2. Has the university provided sufficient resources and support to ensure that the teaching and learning process runs smoothly in online teaching?
3. What kinds of preparation are necessary to teach online?
4. What challenges have you encountered teaching online?
5. How do you get students to do the work and keep them motivated and engage in classes?
6. How has online learning affected your administrative workload?
7. How have you been assisting students that were left behind catch up?
8. Are you confident and satisfied with Think Learn Zone as a tool of teaching and learning?
9. What are the implications of using Think Learn Zone?
10. Do you have any additional information you would like to add that will contribute to the effectiveness of online learning?

APPENDIX F: EDITING CERTIFICATE

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EDITING CERTIFICATE

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Doctoral thesis DUT: **A CRITICAL EXAMINATION OF THE
MANAGEMENT OF ACTIVITIES LINKED WITH WEB-BASED
LEARNING MANAGEMENT SYSTEM AT THE DURBAN
UNIVERSITY OF TECHNOLOGY**

I confirm that I have edited this thesis and the references for clarity, language and layout. I returned the document to the author with track changes so correct implementation of the changes and clarifications requested in the text and references is the responsibility of the author. The intellectual content of the document is the responsibility of the author. I am a freelance editor specialising in proofreading and editing academic documents. My original tertiary degree which I obtained at the University of Cape Town was a B.A. with English as a major and I went on to complete an H.D.E. (P.G.) Sec. with English as my teaching subject. I was a part-time lecturer in the Department of Homoeopathy at the Durban University of Technology for 13 years and supervised many master's degree dissertations during that period.

Dr Richard Steele

15 September 2023

per email