Investigating the study habits of undergraduate students during blended learning at a South African University

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Declaration

I, Langa Dube, declare that this research report is my own work except I have explicitly indicated otherwise. I have followed the required standards in referencing the work, thoughts, and ideas of others. This research is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. I confirm that the research report has not been submitted before, in this or any other university.

Name: Langa Dube

Signature: *Langa Dube*

Signed at …Sandton

On the ……04…….. day of …February ……. 2024…..

ABSTRACT

Blended learning provides a mechanism to enable flexibility for students and lecturers using technologies for learning and teaching. Greater internet access in South Africa has promoted the adoption of blended learning in recent years, while the COVID-19 pandemic accelerated the uptake of technologies which enabled continuity of learning during times of disruption. Whilst blended learning has seen greater adoption in higher education, challenges ranging from infrastructural challenges to emotional and psychological elements remain. This study contributes to how South African university student study habits are changing due to the changes in mode of provision. This case study, at the University of the Witwatersrand, South Africa, investigates the relationship between blended learning and study habits. The study addresses two research questions: what study habits are being used by undergraduate students in a post-pandemic blended learning environment? and, how are post-pandemic blended learning study habits influenced by learner characteristics such as digital literacy and educational experience? Using a quantitative research method, an online survey was completed by 122 undergraduate university students.

Reliability and validity tests were conducted on the data which was analysed using multivariate statistical techniques. The main findings of the study were: Firstly, blended learning is positively associated with study habits. Respondents had more positive experiences in their study habits including improved time management, work and study balance, and improved test strategies. However, there were some negative experiences that related to ICT availability, instability of electricity supply, inability to manage home and work balance, and emotional strain. Greater support for students in these areas could assist in improving blended learning experiences. Secondly, learner characteristics such as digital literacy and education experience were positively associated with study habits. The greater the digital literacy and educational experience, the better the student blended experience. The study further revealed that the impact of load shedding has a negative impact on the blended learning context.

KEYWORDS

blended learning, higher education, learner characteristics, student experience, study habits.

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Finally, to the Lord Almighty who has given me strength, wisdom and grace to go through this intensive programme, thank you Lord.

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LIST OF ACRONYMS

4IR - Fourth Industrial Revolution

COVID - CoronaVirus Disease

ERTL - Emergency Remote Teaching and Learning

ICT - Information and Communication Technology

LMS - Learning Management System

POPIA - Protection of Personal Information

SPSS - Statistical Package for the Social Sciences

CHAPTER 1. INTRODUCTION

1.1 Statement of purpose

The purpose of this quantitative study is to investigate the study habits being cultivated and used for blended learning by undergraduate students at a South African University emerging from a period of disruption. The reason for the study is to determine how students can be supported to be more successful in blended learning environments, as institutions and students emerged from the COVID-19 pandemic. In addition, the study intends to explore the relationship between blended learning and study habits.

1.2 Background of the study

Blended learning, sometimes referred to as mixed-methods or hybrid learning, is the process of bringing together learning in an online environment with traditional face-to-face learning (Draffan & Rainger, 2006). It has become more popular in higher education over the past decade (Dziuban et al., 2018). The demand for the introduction of blended learning methods in higher education has increased significantly to provide the requisite flexibility that will meet the everchanging requirements and priorities of students whilst improving the overall learning experience (Alammary et al. 2014; Güzer & Caner, 2014).

The outbreak of the COVID-19 pandemic has accelerated blended learning adoption across the globe as the circumstances compelled education institutions to find ways to continue learning under the changed operating environment. As a result, many education institutions embraced the accelerated rollout of digital learning platforms and Information and Communication Technology (ICT) infrastructure to cope with the demand (Ali, 2020). This scenario posed an opportunity to adopt Fourth Industrial Revolution (4IR) technologies and incorporate learning platforms across all levels of learning in South Africa (Mhlanga & Moloi, 2020). The 4IR is defined as “cyber-physical systems involving entirely new capabilities for people and machines” (Davis, 2016, para. 4).

Given the high levels of inequality in South Africa, students come to universities with varying levels of digital literacy and learning skills from their schooling years (Du Preez & le Grange, 2020). Therefore, universities need to provide learning experiences that offer a level playing field to ensure that students succeed in their quest for higher education through adopting digital learning (Mhlanga & Moloi, 2020). Additionally, post-COVID-19, there could be new study habits needed to excel in a combination of both digital and physical learning environments.

This study investigates undergraduate student study habits and blended learning at one research intensive university in South Africa. The University of the Witwatersrand ("Wits"), one the largest public universities in South Africa, is a contact institution based in Johannesburg. It has five faculties and 34 Schools. Wits had a student population of 42 175 students, of which 23 799 were undergraduates, in the 2021 academic year (Wits University, 2021a). As part of the institutional five-year learning and teaching plans for 2014-2019 and 2020-2024, the university had identified blended learning as strategic goal in order to increase "flexible and life-long learning opportunities" (Wits University, 2019, p. 11). Related to this goal, other focus areas in the 2020-2024 plan supported the creation of an educational environment conducive for blended learning. These included "diversifying assessment methods" and "expanding innovative formal and informal learning spaces" (Wits University, 2019, p. 3). While the COVID-19 pandemic caused widespread disruption to learning and teaching, it also provided the institution with the impetus to address some of these focus areas more rapidly.

1.3 Research problem

The outbreak of the COVID-19 pandemic meant that governments worldwide implemented restrictions such as lockdowns. This gave rise to the need for traditional contact universities to implement learning methods that went beyond face-to-face interactions to comply with these restrictions and ensure that learning could continue (Ali, 2020). This came to be known as Emergency Remote Teaching and Learning (ERTL) (Hodges et al., 2020). However, both lecturers and students may struggle with adapting to different or new modes of learning. Furthermore, moving from ERTL to post-pandemic blended in yet another shift, students may still need to develop or

enhance the requisite study skills and habits to succeed in their studies utilising blended learning (a combination of both face-to-face and online methods).

Therefore, this research aims to investigate the adoption of post-pandemic blended learning and what study habits are used for blended learning by undergraduate students in South African higher education. The study habits being utilised for blended learning at one South African university in particular, the University of the Witwatersrand, are investigated.

During the COVID-19 pandemic in 2020 and 2021, the University of the Witwatersrand moved its academic programmes online to complete the academic years. As more on-campus activities were possible as the pandemic restrictions were lifted, the university's annual learning and teaching plan in 2022 then shifted towards blended learning and teaching (Wits University, 2021b). It is not clear how students, still dealing with the impact of a rapid shift to online learning from face-to-face learning in 2020, are adapting to blended learning post-pandemic and how this affects their study habits.

1.4 Research questions

The study intends to answer the following key research questions:

1. What study habits are being used by South African undergraduate students in a post-pandemic blended learning environment?
2. How are post-pandemic blended learning study habits influenced by learner characteristics such as digital literacy and educational experience (year of study)?

1.5 Rationale

This study intends to contribute to the body of knowledge in this field by providing insights into how students at a South African university are learning using a blended approach, particularly in the context of emerging from the disruption caused by the COVID-19 pandemic. This may be useful to consider how South African universities (both lecturers and administrators) can better support students' study needs in a post-pandemic blended learning environment so that they can be successful in this learning

environment. Undergraduate university students themselves may benefit from the study by gaining insights into the study habits being used by fellow students in a blended learning environment. University students could also benefit from the insights from this study on how to support each other during peer-to-peer learning or when they are working on group assignments and projects across online and face-to-face spaces.

1.6 Delimitations of the study

The study is limited to the perceptions of undergraduate-level students at one particular university in South Africa, the University of the Witwatersrand. Postgraduate level students, and students at other South African and international universities, are excluded from the study. The study looks at the study habits used for blended learning in a post-pandemic context, it does not attempt to consider the impact of blended learning study habits on student performance or student success, or how blended learning took place prior to the pandemic. The study focuses on the perspectives of students, it does not consider the perspective of academic staff.

The study was conducted via an online self-administered questionnaire; therefore, it has a quantitative focus. Qualitative data were not collected aside from one broad open-ended question.

1.7 Definition of terms

Blended learning: the construction of the “appropriate use of a mix of theories, methods and technologies to optimise learning in a given context” (Cronje, 2020, p. 120).

Learner characteristics: the attributes that are important to include in planning student learning experiences such as digital literacy, study characteristics, prior learning, ICT skills and time management (Draffan & Rainger, 2006).

Study habits: how students approach and prepare for their learning process in the classroom, during group sessions, and in private study time to establish mastery in a specific subject or area of study (Lee, 2010).

Undergraduate students: students studying towards an undergraduate qualification (usually National Qualifications Framework Levels 5-7). This includes bachelor's degrees and diplomas (Council on Higher Education, 2013).

1.8 Assumptions

This research assumes that there are sufficient responses to the survey to support findings that would enhance the quality of the conclusion formulated for worthwhile research. Another assumption underpinning this research is that students are making use of different study habits or new study habits are emerging for learning in a blended learning environment post-COVID. It is also recognised that these experiences may be different to blended learning experiences in prior (pre-COVID) years or in the future. As the survey is not course specific, it is expected that students would provide an overall view of their experiences in a blended learning environment in 2022. However, it is recognised that how each course is taught may vary considerably (some courses may be more face-to-face oriented while some may utilise more online components).

1.9 Chapter Outline

The research report consists of six chapters. This first chapter introduces the research and provides the background, research problem and questions to address. The second chapter reviews the relevant literature and provides a theoretical framework for the research. The third chapter outlines the research methodology and design, the fourth chapter presents the results through the descriptive and inferential analysis. The fifth chapter provides the discussion of the findings, and the sixth chapter provides the conclusion and recommendations of the study.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

There are different definitions of what blended learning is. Often the focus is on blended teaching “that is facilitated by the effective combination of different modes of delivery, models of teaching and styles of learning, and founded on transparent communication amongst all parties involved with a course” (Draffan & Rainger, 2006, p. 3). This view, of needing to consider multiple dimensions that affect blended learning and teaching, is shared by Joosten et al. (2021, p. 14) who define blended learning as “instruction that blends technological, temporal, spatial, and pedagogical dimensions to create actualized learning”. Recognising a common focus on technology and blended teaching rather than on blended learning, Cronje's (2020, p. 120) definition of blended learning instead emphasises the “appropriate use of a mix of theories, methods and technologies to optimise learning in a given context”.

The literature review considers the implementation of blended learning in higher education and the use of blended learning in a South African context, specifically during and after the disruption of the COVID-19 pandemic. It also considers the study habits used by students in higher education and the relationship between learner characteristics and blended learning.

2.2 Blended Learning: Flexibility and Continuity

Previous research has found that students in blended learning courses achieve positive performance results and satisfaction when compared to the outcomes of students in courses conducted face-to-face or online (Dziuban & Moskal 2011; Means et al., 2013). Furthermore, those unable to achieve a more positive result in a blended learning environment often cite the lack of support provided by the institution in redesigning the course and poor planning as the main negative contributing factors (Tynan et al., 2015; Dringus & Seagull, 2013). Therefore, moving from face-to-face learning to a blended approach in a well-structured and supported manner appears to have benefits for student learning.

A study was conducted to identify the influence of activities learning in an online course versus the results of learning learners who had taken part in a blended course (Nguyen, 2017). The study used students' learning analytics and showed that the interaction of the students was effective with the blended learning activities during the course and would provide better results. The quantitative results also showed that the interaction between the students has a significant influence on the outcome of their learning. Therefore, designing learning activities that enable interactions between students is essential for blended learning courses (Nguyen, 2017).

Blended learning has enabled continuity of learning and teaching in times of disruption, ushering in a new way of learning and teaching for many universities and students (Ali, 2020). Yet it is seen as important for learning post-pandemic. Graham and Halverson (2023, p. 13) note that "it is likely that blended practices that combine both online and in-person instruction will become increasingly prevalent across all educational sectors". This will require understanding of "how different blended models and pedagogical practices within those models work to improve learning outcomes, increase access and flexibility for learners, and impact cost efficiencies" (Graham & Halverson, 2023, p. 13). The blended mode of provision is associated with challenges that need to be overcome such as building appropriate infrastructure and providing emotional and psychological support for students to cope with this way of learning in the post-pandemic world (Singh et al., 2021; Mhlanga, 2021).

Singh et al. (2021) found that appropriate infrastructure is key to ensure effective learning experiences for all stakeholders involved in the learning process to support blended learning success. Another finding in that study highlighted the capacitation of the tutors and administrators as key factor in ensuring relevant knowledge and support for new blended practices, tools and technologies (Singh et al., 2021).

2.3 Blended learning in a South African context

Higher education in South Africa takes place in a context of inequality among its citizens. Du Preez and le Grange (2020, p. 94) argue that "in an unequal country such as South Africa, there is unequal access to technologies used in online learning as well as unequal access to data and connectivity". The outbreak of the COVID-19 pandemic created an emergency for higher education institutions in South Africa that required

them to put in place processes and systems to ensure continued learning (Du Preez & Le Grange, 2020). The changes brought about by COVID-19 exposed the long-standing digital divide in a very unequal country with limited access to technology and a low uptake of technology by universities (Du Preez & Le Grange, 2020). Whilst the digital divide was exposed in more detail during COVID-19, part of the solution to make blended learning successful lies in enacting policy directives that can systematically address inequality, improve digital skills and promote access in South Africa (Mhlanga, 2021).

Various learning platforms such as Blackboard Collaborate, Microsoft Teams, Canvas, and Zoom, are used in South African higher education institutions to provide access for students in blended or online settings (Makgahlela et al., 2021; Matarirano et al., 2021). However, access to learning platforms requires the student to have an appropriate device, internet connectivity, and ICT skills to navigate the technology, as well as the right attitudes, to be effective (Czerniewicz et al., 2020). Learning Management Systems (LMS) provide essential tools that enable students to be interactive in a course, like messages, forums, online assignments, online forms, online exercises, and virtual classes. These tools also assist lecturers in monitoring and tracking a student's learning progress, like the status of submitted assignments, the statistics for the frequency of access, and logs of activity in the LMS (Ssekakubo et al., 2012).

Access to ICT infrastructure and data at a reasonable cost plays a significant role in facilitating a blended learning environment for universities, particularly in South Africa, which has high levels of inequality (Czerniewicz et al., 2020; Du Preez & Le Grange, 2020). Du Preez and Le Grange (2020) highlight that lessons learned from the pandemic indicate that universities can improve access to ICT through government and private partnerships. Additionally, to improve blended learning efforts in the South African context, having a closed-loop feedback system and improving students' online experiences is required (Du Preez & Le Grange, 2020).

COVID-19 has not been the only disruption that has resulted in a greater consideration for blended learning in South African higher education. Basitere and Ivala (2017) explored student blended learning experiences utilising a combination of the WileyPLUS system and a WhatsApp group as supplementary method to campus

learning for a Physics course during the #FeesMustFall protests by students. Basitere and Ivala (2017) found that universities require a higher degree of preparedness for blended environments especially for unified ICT access to avoid exclusion of previously disadvantaged students and further entrenchment of the digital divide. From a staff perspective, Czerniewicz et al. (2019) conducted a study with academics to get their views, perspectives and practices on using online material during the challenging time of #FeesMustFall protests between 2015-2017. This study similarly found a lack of institutional preparedness to support students and no unified approach on the use of technology and learning development to support blended learning in the context of that crisis.

A study was conducted by lecturers at a university in South Africa on the teaching possibilities for universities to support a blended learning modality in a post-COVID world (Brodie et al., 2022). The study found that two key prevailing themes needed to support student success: “attending to students’ socio-emotional needs” and “developing students’ engagement, self-regulation and reflexivity” (Brodie et al., 2022 p. 74). This meant that transitioning to ERTL (and later transitioning from ERTL) required that student learning experiences and preferences be considered to ensure successful outcomes. It also highlighted that cultural elements and teaching methods need to be co-considered to facilitate new ways of learning.

2.4 Study habits and techniques used in higher education

Credé and Kuncel (2008, p. 427) define study habits as “the degree to which the student engages in regular acts of studying that are characterized by appropriate studying routines (e.g., reviews of material) occurring in an environment that is conducive to studying”. These habits are related to, but separate to, study skills and attitudes. Study skills can be seen as “the student’s knowledge of appropriate study strategies and methods and the ability to manage time and other resources to meet the demands of the academic tasks” whereas study attitudes “refer to a student’s positive attitude toward the specific act of studying” (Credé & Kuncel, 2008, p. 427). Credé and Kuncel (2008) found that measuring study habits and study skills can help predict academic performance. A similar finding was made by Mendezabal (2013). For the purpose of this study, the relevant study habit constructs and descriptions have

been adapted from Credé and Kuncel (2008) who utilised a scale from Weinstein and Palmer (2002, as cited by Credé & Kuncel, 2008), as shown in Table 1.

Table 1: Learning and Study Skills Inventory (adapted from Credé & Kuncel, 2008)

Skill/Habit	Description
Time management	Assesses the student's application of time management principles to academic situations
Concentration and memory	Assesses the student's ability to direct and maintain attention on academic tasks
Note-taking	Assesses the student's use of supports or resources to help them learn or retain information
Test strategies	Assesses the student's use of test preparation and test taking strategies
Organising and processing information	Assesses how well the student can use imagery, verbal elaboration, organization strategies, and reasoning skills as learning strategies to help build bridges between what they already know and what they are trying to learn and remember
Motivation	Assesses the student's diligence, self-discipline, and willingness to exert the effort necessary to successfully complete academic requirements

A study was done to survey university students in Asia to "investigate the perceptions of students about their own study habits in eight different areas, which include time management, concentration and memory, note taking, test strategies and test anxiety, organizing and processing information, motivation and attitude, reading and writing" (Lee, 2010, p. 1). These habits were adapted from Credé and Kuncel (2008) and University of Houston Libraries. However, the only available version of the University of Houston instrument is the current version (University of Houston, 2023). The study found that motivation and attitude play a prominent role in student performance, together with good study habits (Lee, 2010).

Mendezabal (2013) found that certain study habits had a negative impact on university student performance, namely, poor time management, lack of reading and test-taking

skills, and unfavourable attitudes toward teachers. Magulod Jr (2019, p. 184) studied the “study habits and level of academic achievement of students enrolled in applied science courses of one campus of a public higher education institution in the Philippines”. The findings indicate that there is a significant relationship between study habits and academic performance. Therefore, a focus on study habits is critical for identifying what students need to do to be successful in their studies.

2.5 Student characteristics and blended learning

Learner characteristics are defined by the attributes that are important to include in planning student learning experiences. These may include digital literacy skills, age, attitudes to learning, prior learning and other attributes that may be considered when planning student learning experiences (Draffan & Rainger, 2006). Alzahrani and O’Toole (2017) found that neither experience with the Internet nor the programme developed was seen as an influence on a student’s preference for blended learning. However, they noted that other variables such as the year of study, age, and attitude towards using the Internet were found to be positive attributes for blended learning. However, Kavitha and Jaisingh (2018) found that blended learning is beneficial for students who are proficient in utilising specialised computer programmes and applications.

Perceptions or attitudes towards blended learning can influence study behaviours. Bouilheres et al. (2020) found that students’ perceptions of their learning opportunities at university were positively impacted due to the blended learning conditions in their courses. Understanding the student’s view of blended learning is critical to achieving the benefits of blended learning since these impressions can be used to develop a more accurate and extensive plan for satisfying the student’s academic objectives (Kim, 2012). Keržič et al. (2019) found that the attitude of students toward the subject matter and the classroom performance of a lecturer to have a direct influence. In contrast, the acceptance of technology had an indirect effect. Harrington and Loffredo (2010) and Venkatesh et al. (2014) found that introverted learners would usually prefer a blended learning approach. On the other hand, extroverted learners gave a significantly lower preference for online learning; hence, the preference for face-to-face courses was higher. Additionally, to succeed in blended learning the technology needs

to be used appropriately for learning and this requires spending time learning a particular technology and making a particular connection with the industry usage for their career in the future (Venkatesh et al., 2014).

Diep et al. (2017) focused predominantly on the “modalities” aspect of blended learning or the degree to which it is incorporated into the teaching approach. They deduced that in a more focused blended learning environment, the LMS has a larger effect on a student’s appreciation of online learning. Blended learning is seen as beneficial, entertaining, supporting, adaptable, and a stimulator of learners, as per Güzer and Caner’s (2014) study of the 28 most commonly quoted articles/books on blended learning published from 1999 to 2012.

To conclude the literature review, there are notable learner characteristics that have a bearing on study habits that would influence success in a blended learning environment.

2.6 ANALYTICAL FRAMEWORK

2.6.1 *Theoretical Framework*

The literature reviewed shows that learner characteristics are an important foundational pillar for success in a blended learning environment. These include attitude toward learning, age, year of study, introvert-extrovert orientation, self-confidence, and cultural orientation (Harrington & Loffredo, 2010, Venkatesh et al. 2014, Alzahrani & O’Toole 2017, Keržič et al. 2019).

Therefore, this study has adopted the model proposed by Draffan and Rainger (2006) as a theoretical framework that will enable the study of the relationship between learner characteristics and the blended environment and how this environment influences study habits. The model captures a holistic view of the learning process whilst considering the teacher/lecturer and student perspectives. The model supports the processes for analysing benefits and challenges in a blended learning context. For this study, the student perspective has mainly been considered. Figure 1 provides an overview of the model of the challenges to blended learning from a student perspective.

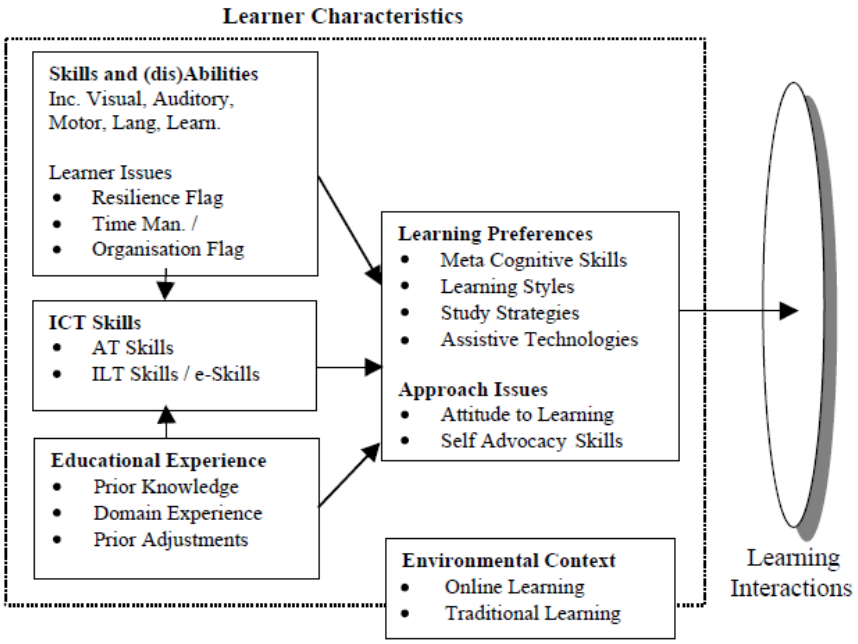

Figure 1: A model of the challenges to blended learning from a student perspective (Draffan & Rainger, 2006).

Draffan & Rainger (2006) consider students' skills and abilities, ICT skills, educational experience and learning preferences to influence blended learning experiences. Lecturers need to consider these characteristics when designing learning interactions. "Students' physical, sensory and perceptual skills and abilities, attitudes, coping strategies, prior knowledge and proficiency in the use of technology may all contribute" to how a blended learning situation is approached (Draffan & Rainger, 2006, p.56). Another aspect is a student's proficiency in using ICT which is a critical skill in blended learning. This may include the need for assistive or adaptive technologies to support students. Educational experience captures the learning journeys and prior experiences of the student. Students have different learning preferences and mechanisms of coping in the learning context. In the current study, this will investigate the relationship between blended learning and study habits. Additionally, the environmental context (mix of face-to-face and online learning) also affects blended learning experiences. The environmental context is important factor for the student due to the use of different approaches and tools in online and face-to-face learning (Draffan & Rainger, 2006). Another key component to investigate is student study habits. The study habit

descriptions by Lee (2010) and Credé and Kuncel (2008) were drawn on to measure study habits.

2.6.2 *Conceptual Framework*

There are three major variables in the study:

Blended learning which is defined as the construction of the “appropriate use of a mix of theories, methods and technologies to optimise learning in a given context” (Cronje, 2020, p. 120).

Study habits which refer to how students approach and prepare for their learning process in the classroom, during group sessions, and in private study time to establish mastery of a specific subject or area of study (Lee, 2010).

Learner characteristics which are defined as attributes that are important to include in planning student learning experiences (Draffan & Rainger, 2006).

The relationship between blended learning as an independent variable, learner characteristics as a moderating variable, and study habits as a dependent variable is represented in the conceptual framework. Figure 2 provides an overview of the conceptual framework of the study.

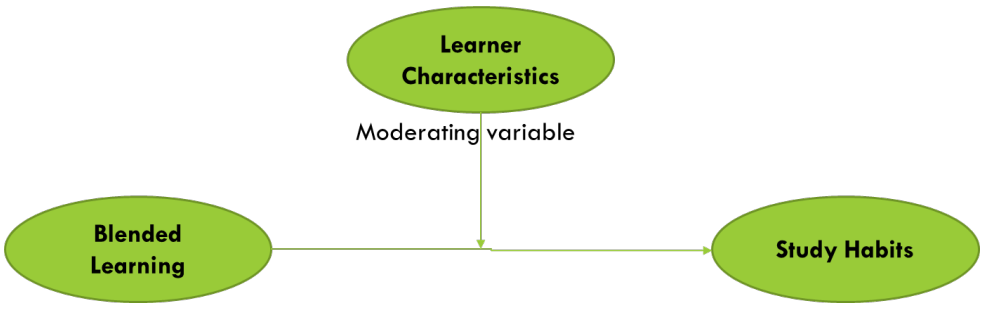

Figure 2: Conceptual Framework

The relationship follows the moderating principle because the causal relationship between blended learning and study habits changes as function of learner characteristics. Furthermore, the interaction between blended learning and learner characteristics is significant supporting the mediation principle (Baron & Kenny, 1986).

2.7 Conclusion of Literature Review

Blended learning is enabled through digital infrastructure, which can often be a challenge in the South African context. However, there are several dimensions to be considered in blended learning in a higher education context that can support flexibility and continuity of learning, such as infrastructure, planning and design, student support and student characteristics. From the literature reviewed, it can be noted that many studies focus on the factors that influence the blended learning environment along with recognising the usefulness for students (Keržič et al., 2019, Venkatesh et al., 2014, Kavitha and Jaisingh, 2018). The current study focuses on understanding how blended learning occurs at a South African university and the relationships between blended learning, learner characteristics and study habits. Based on the research questions, there are two hypotheses that this study explores:

2.7.1 *Hypothesis 1*

H1. There is a positive association between blended learning and study habits.

2.7.2 *Hypothesis 2*

H2.A. There is a positive association between digital literacy and study habits.

H2.B. There is a positive association between education experience (year of study) and study habits.

CHAPTER 3. RESEARCH METHODOLOGY

The research methodology chapter starts by outlining the research approach and design. This is followed by a discussion of the data collection methods, the population, and the sampling methods. The research instrument (questionnaire) and the data collection and data analysis procedures are outlined. Then, possible limitations and challenges, quality assurance, and ethical considerations are considered.

3.1 Research Design

A quantitative research design has been chosen for this study as it aligns with answering the research questions of the study. The research design for the study is survey research. This is a non-experimental design that measures independent and dependent variables and uses statistical methods to measure the variables and test their effects (Bhattacherjee, 2019). A quantitative survey was sent to prospective respondents to complete. The unit of analysis is the students at the university that are engaged in blended learning. The survey approach provides the ability to generalise and draw further inferences from the results obtained to a broader audience. A set of standardised questions that are open and closed can be used to ensure more informed conclusions. The data was collected from the source directly and thus considered to be authentic for research purposes (Kabir, 2016). Survey research is an appropriate approach to testing theory. The benefits of this design are that it can measure a variety of unobservable data (such as student preferences) and collect data remotely and unobtrusively from many participants (Bhattacherjee, 2019). The study made use of correlational research to test the hypothesis about the relationships between the three variables in the study. This approach is suitable for the study to answer the research question, i.e., what study habits are students using in a blended learning environment and whether students' characteristics such as attitudes towards learning and ICT skills influence the study habits positively or negatively. Furthermore, the correlational approach is objective: data can be collected from a representative sample, data can be generalised, hypotheses can be tested, and it considers research reliability and validity measures (Hair et al., 2011).

3.2 Data collection methods

The data collection method was an electronic survey that was sent out to university students via a university email address. The survey was emailed to individuals requesting them to complete it within a given time. The survey responses were anonymous.

The questionnaire was designed in a manner that it is easy to understand and relatively quick for respondents to get through in a short space of time. The survey was administered electronically. The benefit of this approach is that it is low-cost, easy to administer, and scalable (Debois, 2019). However, there are some potential drawbacks to this approach, such as respondents not understanding differences in questions, exhaustion from answering many questions, and unanswered questions or incomplete responses (Debois, 2019). To minimise these risks, the questions were well designed to ensure that they are relatively easy to understand (unambiguous) and can be answered quickly by participants. The survey included mostly closed-ended questions with a few open-ended questions to enable respondents to provide complete responses in their own words. The literacy levels of the targeted population (undergraduate students) were high, and, as such, well-placed to understand the questions.

3.3 Population and sample

The population and sample are defined in this section.

3.3.1 *Population*

The population for the study was university undergraduate students at South African universities engaged in post-pandemic blended learning. This population consisted of students across the different public and private higher education institutions in South Africa.

3.3.2 *Sample and sampling method*

The study focused on the undergraduate students of one university (Wits University) as the sampling frame. This section of the population was accessible to the researcher. The University enrolled 42 175 students for the year 2021, of which 23 799 were undergraduate students (Wits University, 2021a). As such, the sampling frame for the study was estimated to be around 23 799 undergraduate students in 2022/3.

The simple random sampling method was employed to collect the data because it is designed in a way that gives an equal chance of selection for every person in the target sample, as the selection is random and independent of others. The population must be clearly defined when using this method (Taherdoost, 2016). In this instance the simplicity of the sampling method means that it is an appropriate method to select and that the sample is unbiased, and the inferences can be generalised (Bhattacherjee, 2019). Permission was obtained to send the request for participation to the sampling frame via the Office of the University Registrar, which has access to the student database.

Sampling where the precision or sampling error is +-10% means the confidence level is above 95% and the variation of attributes across the target population is low (Israel, 1992). The researcher targeted a response rate of +-240 undergraduate students as a response rate of 1% from the sample for the study (Wits University undergraduate students). This was based on similar response rates in other studies at the university.

The request for participation was sent out to students' university email addresses, via the Office of the University Registrar. This office selected undergraduate students from the student database. In the email, the researcher explained the reason for the study and how the results would give students insights into the study habits adopted for a blended learning environment. A weakness pertaining to the sampling method was that undergraduate students were busy with their studies, which places a demand on their time and, as such, may not prioritise participation in surveys. Other possible limitations of the sampling method are discussed below under Section 3.7 below.

3.4 The research instrument

The research instrument for this study is an electronic survey or questionnaire. This is an appropriate instrument to collect the data to answer the research questions. A questionnaire is a data collection method that consists of questions, which are structured or unstructured, that are presented to the target sample (respondents) to obtain their views and feelings regarding a research phenomenon that enables the researcher to get answers or draw conclusions on the area of research (Collis & Hussey, 2009). The questionnaire for this study contained mainly structured multiple-choice questions and one open-ended question. These questions were drawn up in English only, as the official communication language in the University and the language used for this study. This was a self-administered survey. The benefits of this approach are that the survey can be sent to many participants who can complete the survey at their convenience. It is also inexpensive to administer (Bhattacherjee, 2019).

A Likert scale measurement tool is used for the study. This method is user-friendly and quick to complete (Kabir, 2016). It also allows for completeness of responses (where all questions are answered) and eliminates unreliability (Korstjens & Moser, 2018; Kabir, 2016). The questionnaire for this study has a 7-point Likert scale that covers a range of options to choose from for the closed questions, i.e., strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, and strongly disagree. The main advantage of the 7-point Likert scale is that it is known to be the most accurate of the Likert scales (Longe, 2020). Moreover, it is deemed the most appropriate for surveys as it is relatively simpler to use and gives an excellent reflection of honest evaluation. The only notable drawback is the potential influence of previous questions (Longe, 2020).

Structure of the questionnaire

The questionnaire has thirteen sections covering different components, namely, demographic information, study habits (time management, concentration and memory, study help and note-taking, test strategies, and test anxiety, organising and processing information, motivation, and attitude, reading, writing), using technologies for learning, blended learning, general. The study habit questions in the survey were adapted from

the University of Houston study skills questionnaire (University of Houston, 2023) and the study by Lee (2010), while the questions regarding blended learning and using technologies were adapted from a different questionnaire (Shantakumari & Sajith, 2015). The questionnaire by Lee (2010) was found to have a wide coverage of concepts that make up study habits for students and hence adopted for this study. The same questionnaire was used successfully by Magulod Jr (2019) in a study to investigate study habits and student performance. The survey questions can be found in Appendix A. The different sections of the questionnaire and associated components are depicted in Table 2.

Table 2: Structure of the Questionnaire used in this study

Component	Description
Question 1-7: Demographics	Demographic details such as gender, age group, race Academic information such as faculty, field of study, year of study
Question 8: Time management	Respondents to reflect on the management of time in a blended learning environment when attending lessons, studying, and writing examinations
Question 9: Concentration and memory	Respondents to reflect on their concentration and memorisation levels when attending lessons, studying, and writing examinations in a blended learning environment
Question 10: Note-taking	Respondents to reflect on study habits and note-taking mechanisms in a blended learning environment
Question 11: Test strategies	Respondents to reflect on test strategies in a blended learning environment
Question 12: Organising and processing information	Respondents to reflect on the organisation of information in a blended learning environment
Question 13: Motivation	Respondents to reflect on their motivation in a blended learning environment
Question 14: Reading	Respondents to reflect on their reading habits in a blended learning environment
Question 15: Writing	Respondents to reflect on their writing habits in a blended learning environment
Question 16: Interaction	Respondents to reflect on their interactions in a blended learning environment
Question 17: Using technologies for learning	Respondents to reflect on their experience of using various technologies for learning in a blended learning environment
Question 18: Blended learning	Respondents to reflect on their learning experiences in a blended learning environment
Question 19: General	Respondents to reflect on the overall impact of blended learning on study habits (open question)

3.5 Procedure for data collection

The questionnaire data was administered using Microsoft Forms and collected in March-April 2023. The link to the survey was emailed to potential respondents (current registered undergraduate students) from a Wits University email address by the Office of the Registrar, aligned to data collection processes at the University. The email body text invited participation and explained the purpose of the research and the confidential treatment of information, i.e., that information will be utilised for university research purposes per the Wits University guidelines. Appendix B provides the participation invitation email.

3.6 Data analysis strategies and interpretation

The data were extracted from Microsoft Forms and analysed using the SPSS tool. The choice of a particular statistical tool depends on the number of variables and the scale of measurement (Collis & Hussey, 2009). Univariate tools are used if one variable is involved; bivariate if two variables are being examined; and multivariate techniques if many variables are involved at the same time (Collis & Hussey, 2009). Multivariate statistical techniques were used given that this research examined multiple variables namely the relationships between blended learning, student characteristics, and study habits.

Quantitative statistical measures provided in SPSS were used, such as mean scores and standard deviations for most of the questions in the questionnaire. Furthermore, correlation analysis was employed to evaluate relationships/relations among the variables. After that, multivariable linear regression analysis was used to test the effects of student characteristics on study habits and blended learning on study habits (Collis & Hussey, 2009). Categorical data were described using frequencies and percentages. Quantitative data were described using means and standard deviations for normally distributed data, and data that were not normally distributed are described using medians and interquartile ranges (Collis & Hussey, 2009).

3.7 Limitations and challenges of the study

There are limitations and challenges to the research methodology, namely:

- Respondents have no incentive to compel them to participate. This may result in a low response rate which would limit the data analysis.
- Respondents may not have time to complete the study due to study workloads and other university commitments leading to a low response rate.
- If the length of the questionnaire is too long or there are too many questions, respondents may give up and not complete the survey.

3.8 Quality Assurance

3.8.1 *Validity*

Validity refers to whether the tool measures/evaluates the concept it is intended to evaluate (Sekaran & Bougie, 2013). It is vital to ensure that the measures used in the study are valid. Exploratory factor analysis was used to study the construct validity of the questionnaire and Cronbach's alpha test was applied to check the measure of internal consistency (Korstjens & Moser, 2018).

Internal validity is defined as the extent to which the conclusions of the study reflect the extent of the relationships between the variables under study (Heale & Twycross, 2015). The study can be seen to have high internal validity because the questions were phrased in a manner that enabled the researcher to test the extent of the relationship between student characteristics and study habits and whether blended learning affects study methods.

External validity is defined as the extent to which the findings of the study can be generalised to the entire population (Calder et al., 1982). Although the range of experiences of the respondents varies across the year of study and field of study, the findings of the study were generalisable to the sampling frame because the participants are of similar educational levels and similar age groups.

3.8.2 *Reliability*

According to Sekaran and Bougie (2013), reliability speaks to how consistently the tool measures the concept. Therefore, it is vital to ensure that the measures used in the study are reliable. This research reduced the risk of unreliability because it employed the use of multiple questions about particular constructs drawn from previous studies. Participants answered the same survey; this was to eliminate subjectivity and allow for a more generalised response as each survey was filled out (Kabir, 2016). Most of the questions in the study were closed questions using the Likert scale, which has predetermined options to choose from. This is quick to complete and allows for completeness (where all questions are answered) of responses which reduces unreliability (Kabir, 2016; Korstjens & Moser, 2018).

3.9 Ethical considerations

Researchers must conform to the principle of “do no harm” when conducting their research (Polonsky & Waller, 2011). Adherence to ethical conduct is crucial, and institutions play a pivotal role in overseeing this function by providing the required clearance. In accordance with these principles, the researcher obtained ethical clearance (WBS/DB0318879G/574) from Wits University before data collection through submitting an ethics application. The ethical considerations included a categorisation of the potential risk to participants which was deemed to be low risk. Protection of participant anonymity and the confidential nature of information are key principles for this study.

Informed Consent

Informed consent involves making sure that all those who take part in the research are fully aware of the nature of the research (Schindler, 2019). The researcher ensured that all participants are well informed about the research by attaching a cover letter (email) to the request for participation (Appendix B). This cover letter provided information around why the research is being conducted, the estimated time it would take to complete the questionnaire, any potential harm, information about the protection of their anonymity and confidentiality, and what the data collected will be used for.

Right to Privacy

The right to privacy means that all those who respond to the questionnaire have the right to protect their names and other personal details, including their responses (Schindler, 2019). Participant anonymity was ensured because the study did not seek identifiable information from participants. Furthermore, the findings are reported in aggregate terms, not individually (Schindler, 2019). In alignment with the Protection of Personal Information Act (POPIA) (Republic of South Africa, 2013), the confidentiality of participant information is assured, and participants were free to withdraw from participation at any time while completing the questionnaire.

CHAPTER 4. PRESENTING RESULTS

This chapter presents and describes the results collected from 122 respondents who completed the online survey. Microsoft Forms was used as a tool to collect the data and all respondents completed all the mandatory questions. About 40% of the respondents provided contributions in the general comments section about study habits and blended learning in 2022. The number of respondents were lower than the expected +-240 responses. The researcher ascribes this could be due to the time of the year when the survey data was collected. Due to delays in obtaining ethical clearance, the survey was sent at the beginning of the semester in March 2023, this is generally a period when students are still focused on settling down in the academic activities for the year and not considering their learning experiences from the previous year. University procedures permit that such a survey to students can only be sent once, hence reminders for participation could not be sent. The number of responses received is a limitation for this study.

The first part of this chapter deals with a demographic breakdown of respondents. This is followed by a descriptive analysis of the individual variables. Finally, inferential statistics are presented according to the research questions/hypotheses.

4.1 Demographic breakdown

The study comprised 122 respondents. The age breakdown was as follows: 73% of respondents were between 18-22, 16% were aged between 23 and 27 years, 2% were aged between 28 and 32 years and 9% were aged between 37 and 41 years. Figure 3 shows the age distribution. The University enrolled 23 799 undergraduate students for the academic year 2021 (which is the most recent year of comparison of the university population) (Wits University, 2021a). No age breakdown was provided of students in the 2021 report (Wits University, 2021a). The respondents represent 0.005% of the target sample.

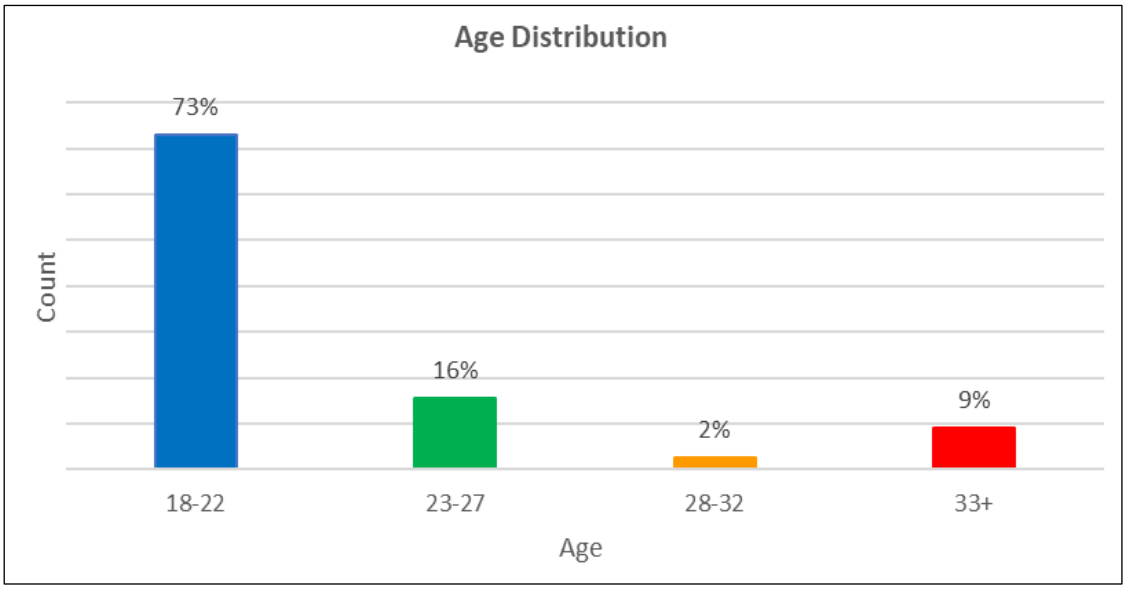

Figure 3 : Age Distribution

The gender distribution of the participants in the survey was 65% Female, 33% Male; and 2% Other. Figure 4 shows the gender distribution. The university had 55.26% Female, 44.66% Male, and 0.8% other enrolled in in the 2020/21 academic year (Wits University, 2021a). In comparison to the overall university gender distribution in 2021, this study had a higher female distribution.

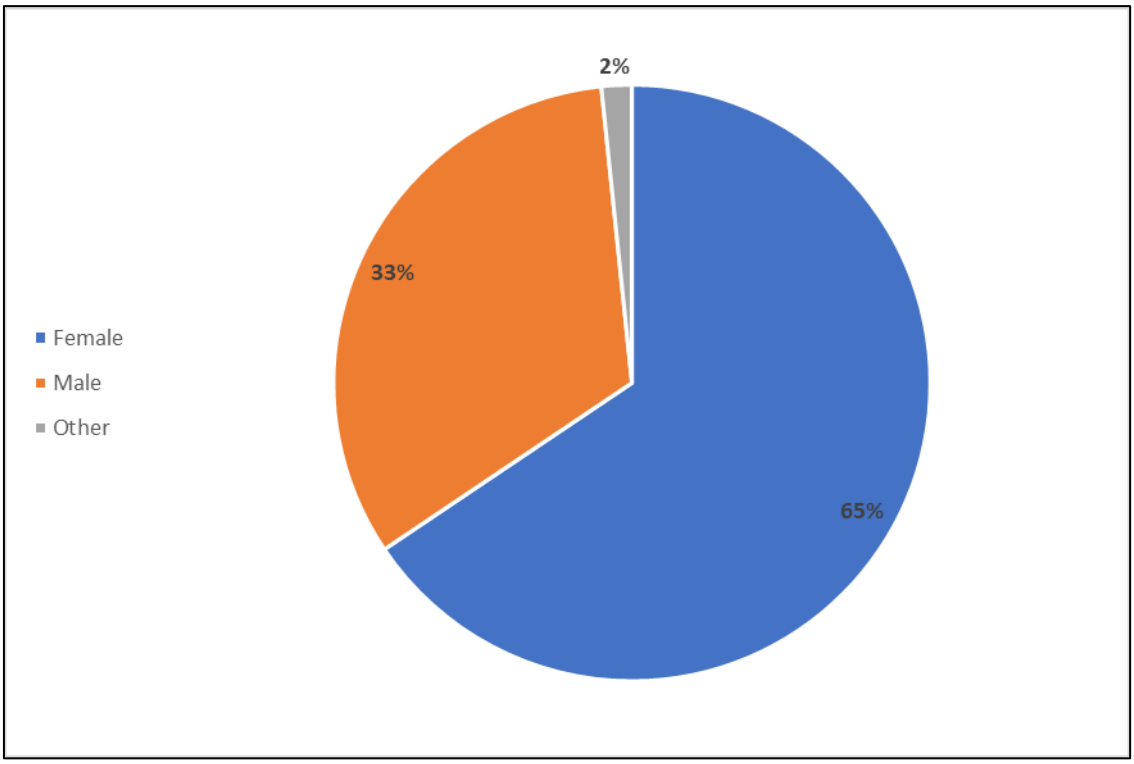

Figure 4 : Gender Distribution

The race distribution of participants in the survey consisted of 63% Black; 20% White; 10% Indian; 5% Coloured; 2% Prefer not to say. Figure 3 shows the race distribution. In comparison to the total number of students enrolled in the 2020/21 academic year, the university had 60.63% African/black, 14.33% White, 11.33% Indian, 3.92% Coloured, 0.34% Chinese and 0.01% Undisclosed (Wits University, 2021a). The race distribution percentages in the survey are largely in line with the overall distribution for the university.

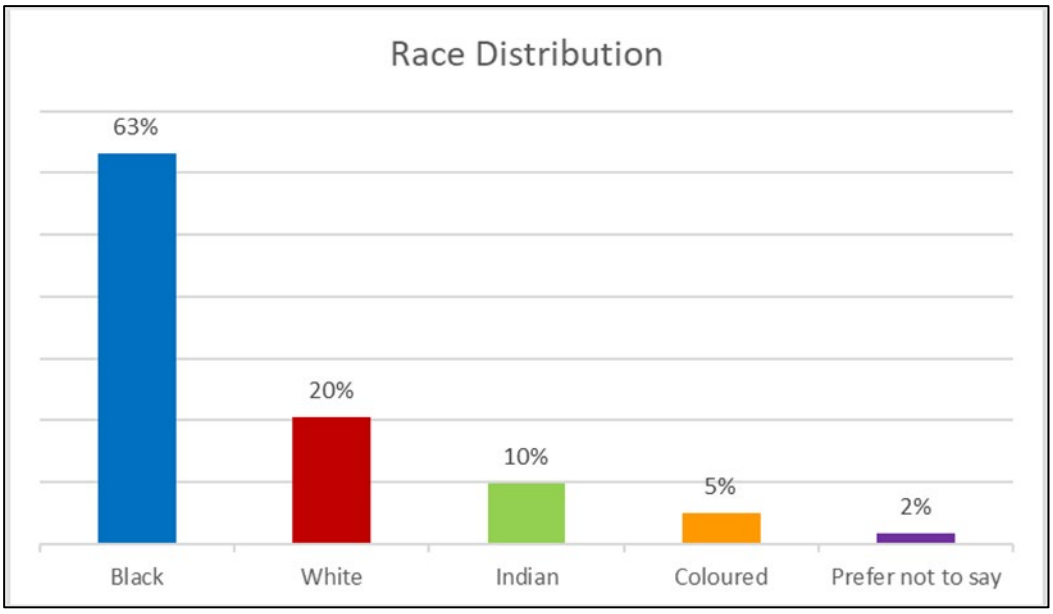

Figure 5 : Race Distribution

Respondents were asked to specify in which School they were studying in. These results were then aggregated into the faculties that each School belongs to. The five faculties of the university were represented as follows: 35% for Commerce Law & Management; 24% for Humanities; 15% for Engineering; 14% for Health Sciences and 12% for Science. Figure 6 shows the overall faculty distribution. The university had an overall spread of 29.82% for Commerce, Law & Management, 26.84% for Humanities; 15.87% for Engineering; 13.41% for Health Sciences, and 14.06% for Science enrolled in the 2021 academic year (Wits University, 2021a). The responses distribution according to faculties seems to be in line with the size of the various faculties, with a slightly higher response rate for the Commerce, Law & Management faculty.

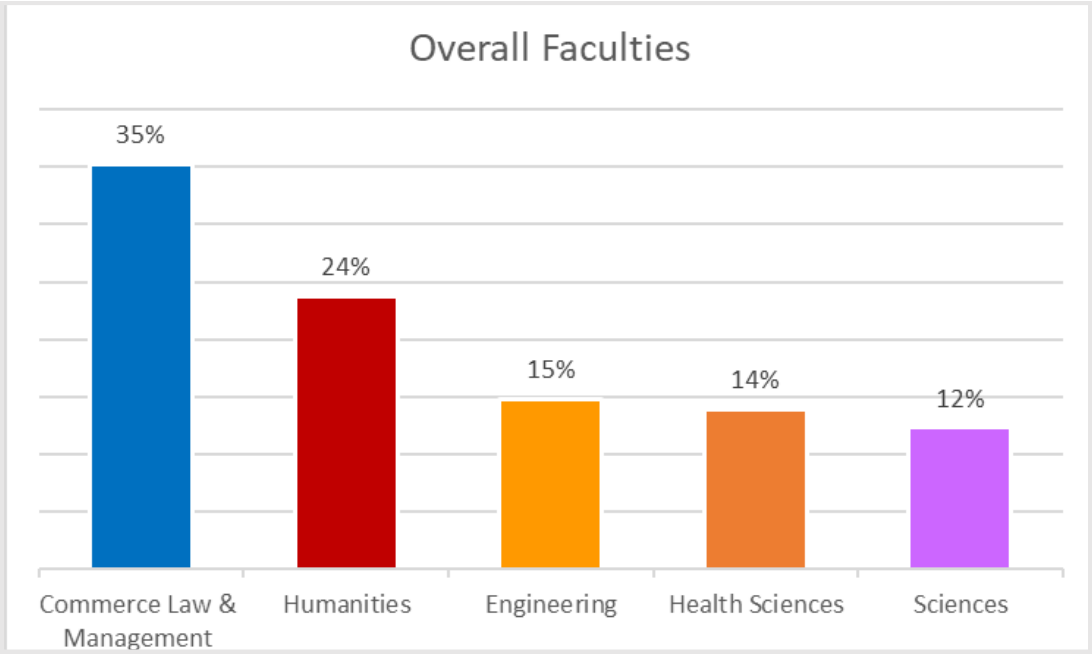

Figure 6 : Faculties Distribution

Respondents were asked about their year of study in the year 2022 as the baseline for the study. The year of study participation was represented as follows Year 1, 27%, Year 2, 37%, Year 3, 28% and Year 4, 8%. Figure 7 shows year of study distribution.

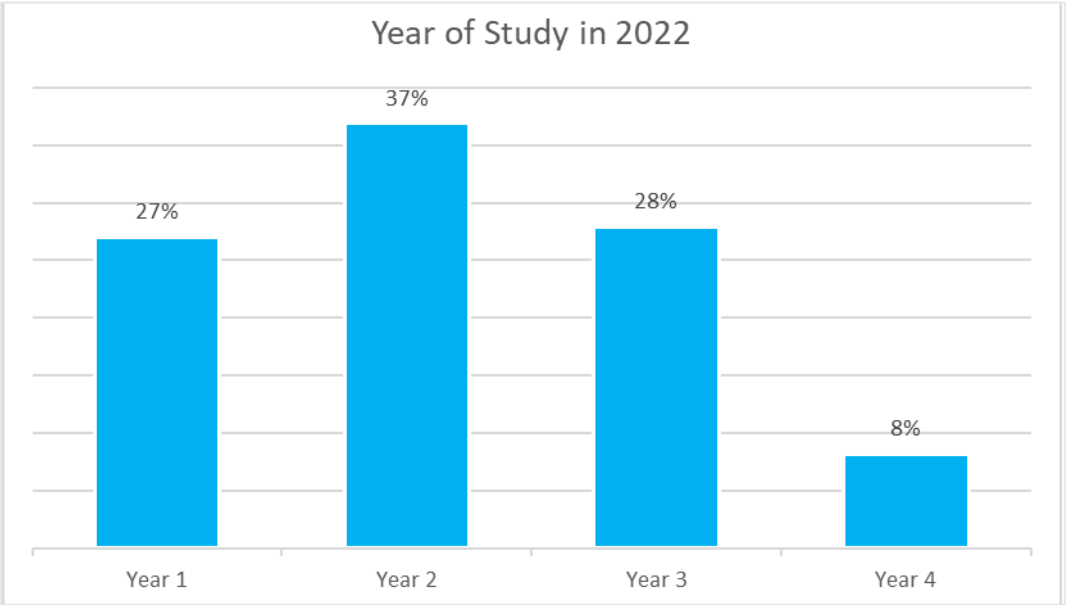

Figure 7 : Year of study in the year 2022

4.2 Digital literacy

Respondents were asked to assess their digital literacy skills on a scale of Excellent, Above Average, Average, Below Average, Very Poor in the survey. Notably, none of the respondents assessed their digital literacy skills on the scale as below average or very poor. This could be somewhat biased because of self-reporting, meaning that students may not have wanted to evaluate themselves as poor in this area or did not want to consider their digital literacy skills as less effective than their peers.

This result could also be an effect of self-efficacy which is the “individual's belief in his or her ability to accomplish a certain task and to produce designated levels of performance with the skills he or she has” (Bandura, 1986, as cited in Eom, 2012, p. 134). Compeau and Higgins (1995, p. 192) provide a definition of computer self-efficacy as “a judgment of one's capability to use a computer”. This definition could support the choice that students made when evaluating their digital literacy score, reflecting their perceived high proficiency in use of technology since they are using technologies for their studies (especially during ERTL). Alternatively, students with low digital literacy may be less likely to complete an electronic survey.

The results show a very strong digital literacy skillset among the respondents with 24% selecting Excellent, 38% Above Average, and 38% Average. Figure 8 shows the digital literacy skills distribution.

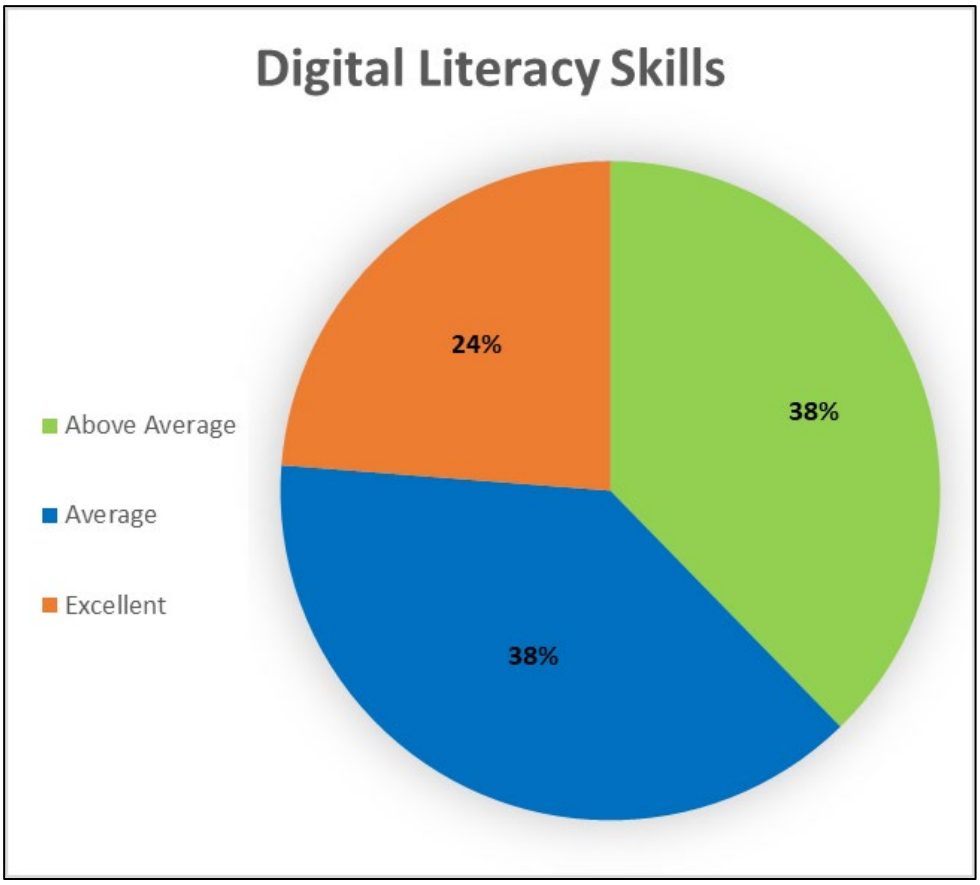

Figure 8 : Digital literacy skills

4.3 Descriptive Analysis

Study Habits in a Blended Environment

The study considered variables that measure different aspects of study habits. Table 3 presents the mean, and standard deviation for ratings that are normally distributed. After testing for normality utilising graphical methods, the ratings were approximately normal. All the ratings were reordered to Strongly Disagree (1), Disagree (2), Somewhat Disagree (3), Neither Agree nor Disagree (4), Somewhat Agree (5), Agree (6), and Strongly Agree (7). The sub-sections below the table provide the analysis of each study habit.

Table 3: Distribution of Study Habits

Question	Mean	Std Dev	Min	Max
8. Time Management				
Question 8.1**:** Blended learning has improved my interaction with fellow students.	4.8	1.7	1	7
Question 8.2**:** I give sufficient study time to each of my courses in a blended learning environment.	4.5	1.7	1	7
9. Concentration and Memory				
Question 9.1**:** I am satisfied with the level of concentration I am able to maintain in when studying	4.3	1.9	1	7
Question 9.2**:** I find that I am able to concentrate – that is, give undivided attention to the task for at least 20 minutes	5.3	1.6	1	7
10. Note Taking				
Question 10.1**:** While I am taking notes I think about how I will use them later.	5.4	1.7	1	7
Question 10.2**:** I organise my notes in some meaningful manner (such as outline format).	5.4	1.7	1	7
11. Test Strategies				
Question 11.1: I begin preparing for major assignments, tests or exams well in advance**.**	4.5	1.8	1	7
Question 11.2: I am calmly able to recall what I know during a test or exam.	5.1	1.5	1	7
12. Organisation and processing information				
Question 12.1**:** I try to organise facts in a systematic way.	5.4	1.3	1	7
Question 12.2**:** I solve a problem by focusing on its main point.	5.4	1.3	1	7
13. Motivation				
Question 13.1**:** I attend class regularly (either face-to-face or online)	5.9	1.5	1	7
Question 13.2**:** I volunteer answers to questions posed by lecturers/ tutors in lectures or tutorials.	4.0	2.0	1	7
14. Reading				
Question 14.1**:** When reading, I can distinguish between important and not important points.	5.1	1.5	1	7
Question 14.2**:** When learning a unit of material, I try to summarise it in my own words.	5.1	1.7	1	7
15. Writing				
Question 15.1 Blended learning has improved my interaction with my fellow students	4.9	1.9	1	7
Question 15.2 Blended learning has improved my interaction with my lecturers/tutors.	4.9	1.9	1	7

Time Management

Respondents reflected on how they managed their time in a blended learning environment when scheduling study times and spending time studying. As seen in Table 3 above, Question 8.1 had a mean of 4.8 and a standard deviation of 1.7. Question 8.2. had a mean rating of 4.5 and a standard deviation of 1.7. Participants reported higher ratings for managing their time through scheduling and goal setting

compared to giving sufficient study time for their courses. The results could point to that respondents can set goals and time more easily for their studies; however, they may have lesser success in the execution of their planned schedule in a blended learning environment.

Concentration and memory

Respondents reflected on their concentration levels when studying in a blended environment. As seen in Table 3, question 9.2. had a higher mean rating (mean=5.3, standard deviation=1.6) compared to question 9.1. (mean=4.3, standard deviation=1.9). Compared to being satisfied with their concentration in general when studying, the participants rated that they could concentrate for at least 20 minutes. This may demonstrate that respondents can focus more on specific or shorter periods of studying.

Note taking

Respondents reflected on their note-taking habits in a blended learning environment. As seen in Table 3, both questions (10.1 and 10.2) had a mean rating of 5.4 and a standard deviation of 1.7. These results may demonstrate that respondents evaluated themselves as strong in their notetaking and organisation level in a blended learning environment.

Test strategies

Respondents reflected on their test strategy habits in a blended learning environment. As seen in Table 3, question 11.2 had a higher mean rating (5.1) compared to question 11.1. This would show that participants may not feel highly anxious during exams or tests. There is also slightly less emphasis on planning and preparations for exams by students which is similar to findings in other undergraduate student studies (Hartwig & Dunlosky, 2012).

Organising and processing information

Respondents reflected on their habits to organise information in a blended environment. As seen in Table 3, both questions had equal means (5.4) and standard deviations (1.3). These scores would show that respondents had a generally higher level of organisation of their information and focusing on the main point whilst carrying out their studies in a blended learning environment.

Motivation

Respondents reflected on their motivation in a blended learning environment. As seen in Table 3, question 13.1 had a higher mean rating compared to question 13.2. The high mean indicates that students regularly participate in classes but that fewer students do so actively (by asking questions).

Reading

Respondents reflected on their reading abilities in a blended environment. As seen in Table 3, both questions (14.1 and 14.2) had the same mean (5.1) and slightly different standard deviations. This high rating would indicate that students feel comfortable in their ability to read and summarise their learning in a blended learning environment.

Writing

Respondents reflected on their writing in a blended learning environment. As seen in Table 3, there were no differences in the means (4.9) and standard deviations (1.9) ratings between the two questions (15.1 and 15.2). These ratings would indicate that students have a good handle of their writing and utilisation of resources in a blended learning environment.

4.3.2. Blended Learning

Questions 16 (2 sub-questions) and 18 (4 sub-questions) measured different aspects of blended learning. These were rated on a 7-point Likert Scale. All the ratings were reordered to Strongly Disagree (1), Disagree (2), Somewhat Disagree (3), Neither Agree nor Disagree (4), Somewhat Agree (5), Agree (6), and Strongly Agree (7).

Table 4 presents summary statistics for student interaction in a blended learning environment. Means and standard deviations were presented in the table if the data were normally distributed. Normal probability plots and histograms were utilised to determine normality and all data were approximately normal.

Table 4: Interaction

Question	Mean	Std Dev	Minimum	Maximum
Question 16.1: Blended learning has improved my interaction with fellow students.	3.5	2.0	1	7
Question 16.2: Blended learning has improved my interaction with my lecturers/ tutors.	3.4	2.0	1	7

Respondents reflected on their interaction in a blended learning environment. As seen in Table 4, participants rated blended learning facilitated interaction with fellow students only slightly more (mean 3.5) than interaction with lectures and/or tutors (mean 3.4). The low means may indicate the interactions may be challenging for many students in a blended learning environment.

Table 5 presents summary statistics for student attitudes to blended learning. Means and standard deviations were presented in the table if the data were normally distributed. Normal probability plots and histograms were utilised to determine normality and all data were approximately normal.

Table 5: Blended Learning Attitudes

Question	Mean	Std Dev	Minimum	Maximum
Question 18.1: I am in favour of incorporating blended learning in my studies.	5.1	1.9	1	7
Question 18.2: Blended learning encouraged me to learn.	4.5	1.9	1	7
Question 18.3: Blended learning is less stressful than traditional in-person learning.	4.4	2.1	1	7
Question 18.4: Blended learning is more effective than traditional in-person learning	4.4	2.1	1	7

Respondents reflected on their attitudes to blended learning during the period. As seen in Table 5, question 18.1 has the highest mean rating, followed by question 18.2. This would represent students having a generally positive view of blended learning being incorporated into their learning process. The lower mean of encouragement of blended learning could be due to adjustments required to adapt to the blended learning environment.

Questions 18.3 and 18.4 had equal mean ratings (4.4) reflecting students had similar personal opinions of the effectiveness of a blended learning environment compared to in-person learning. This would indicate, aligned to a mixed view of blended learning and interactions, students have different preferences for learning environments. Some students may prefer more online learning while others prefer more face-to-face learning.

4.3.3 Using technologies for learning

Respondents reflected on their use of technologies for learning in a blended learning environment. The ratings were reordered to Strongly Disagree (1), disagree (2), Somewhat Disagree (3), Neither Agree nor Disagree (4), Somewhat Agree (5), Agree (6), and Strongly Agree (7). As seen in Table 6, question 17.2 had the highest mean rating, followed by question 17.3. This would reflect that most students found the LMS platform easy to learn how to use and then could easily access and use the LMS for their studies. The University utilises the Canvas LMS (by Instructure), and it is branded “ulwazi”.

Table 6: Using Technologies for Learning

Question	Mean	Std Dev	Minimum	Maximum
Question 17.1: I was able to learn how to use Canvas (ulwazi) quickly.	4.1	1.5	2	7
Question 17.2: I find Canvas (ulwazi) easy to use.	6.2	1.0	2	7
Question 17.3: I am able to access content and activities on Canvas (ulwazi) without any problems.	6.1	1.0	1	7
Question 17.4: My computer skills have improved as a result of blended learning.	5.5	1.7	1	7
Question 17.5: I felt that my knowledge regarding using technology such as Canvas (ulwazi) and Microsoft Teams was limited compared to my peers.	3.3	2.0	1	7

Question 17.4 was the next high rating score which showed that students felt their computer skills improved in the blended learning environment. This would be because of the need to use the LMS platform as a central platform to access learning material and interact with lecturers and peers (particularly during the pandemic). This could also link to the finding that no students reported their digital literacy skills as very poor.

Question 17.1 was the next lower rating indicating that ulwazi was not easy to learn for students, yet they found it easier to use and access after learning as reflected in Questions 17.2 and 17.3. This is worth considering how new students are oriented into using the LMS.

Lastly, question 17.5 had the lowest mean (3.3) rating where students evaluated themselves for knowledge of the use of technologies such as ulwazi and MS Teams. This may suggest a need for improvement of the orientation and support for students for the technologies they are required to use for learning.

4.4 Inferential Analysis

The purpose of this section is to answer the research questions or confirm/falsify the hypotheses made. The analyses were carried out utilising SPSS and Stata 17. The dependent variable (study habits) for all hypotheses, was measured using composite scores from Questions 8 to 15. Cronbach's alpha was calculated to test for reliability and the results are stated below.

Multivariate statistical techniques were used given that this research examined multiple variables, namely, blended learning, learner characteristics, and study habits, as stated in Chapter 2. The demographic data collected from the survey were all string values except for age. The ratings were re-ordered from nominal to ordinal variables to carry out the data analysis.

Dependent Variable: Study habits score

Study habits were measured using a composite score for Questions 8 to 15 on a seven-point Likert scale (see Questions 8 to 15 in the previous section). Each of the eight questions had two questions asked under them thus making 16 items. The original items were re-ordered to Strongly Disagree, Disagree, Somewhat Disagree, Neither Agree nor Disagree, Somewhat Agree, Agree, and Strongly Agree. This was done so that the variables could be ordered to create the composite score. The mean of each of the 16 items was taken to create the score.

Study habits score had a mean of 5.00, a standard deviation of 0.95, a minimum of 1.56 and a maximum of 6.63. Study habits score has 16 items with a Cronbach's alpha of 0.8563 (86% reliable) and blended learning score has 6 items with a Cronbach's alpha of 0.8405 (84% reliable) as seen in Table 7.

Table 7: Reliability of Study Habits and Blended Learning Scores

Variable	N	Number of Items	Cronbach's Alpha	Mean	Std Dev	Min-Max
Study Habits Score	122	16	0.8563	5.0	1.0	1.5-6.6
Blended Learning Score	122	6	0.8405	4.1	1.5	1-7

N=number of observations; std=standard deviation, Min-Max= Minimum and Maximum

Since the response variable of interest is continuous, simple and multivariable linear regression analyses were utilised to carry out the analyses for all three hypotheses (Collis & Hussey, 2009). As indicated, study habits are the outcome/response variable of interest for all three hypotheses.

The simple or unadjusted linear regression model significance level for variable inclusion was initially set at 20% as recommended by Hosmer et al. (2013) to do the initial screening and not leave out any important variables. For the multivariable linear regression, a stepwise backward deletion approach was utilised for model building. The significance for model building was initially set at 10%. The significance level for the final model was set at 5%. Model diagnostics such as normality of error terms and heteroscedasticity were carried out and reported using graphical techniques as shown in Figures 9 and 10.

Since all hypotheses have a common response variable, study habits, there was one unadjusted/simple linear regression model carried out that included all three explanatory variables for all the hypotheses respectively, and all the demographic variables were added as a priori, as well as other variables that satisfy the 25% initial screening criteria.

Unadjusted estimates for all hypotheses

The results of the unadjusted/simple linear regression models on factors associated with study habits indicated that blended learning was positively associated with study habits (Coefficient= 0.16, 95% CI 0.05, 0.27). This is shown in Table 8. The Coefficient score of 0.16 means that for every unit increase in the blended learning score, the study habits score increases by 0.16 on average.

Computer skills rating was positively associated with study habits, as shown in Table 8 (Coefficient= 0.18, 95% CI 0.08, 0.27), as well as limited knowledge on ulwazi and Teams rating (Coefficient= 0.09, 95% CI 0.01, 0.18).

Knowledge of ulwazi was positively associated with study habits as shown in Table 8 (Coefficient= 0.09, 95% CI 0.01, 0.18). This means that for every unit increase in

knowledge of Ulwazi rating, the study habits score increases by 0.09 on average. Computer skills rating was positively associated with study habits.

Digital literacy, faculty, year of study, age, and the ulwazi ease of use rating were all not significantly associated with study habits.

Table 8: Unadjusted/Simple linear regression analysis on factors associated with study habits among Wits University undergraduate students in 2022 (n= 122).

Variable	Adjusted Coefficient (95% CI)	P-value
Blended Learning Score	0.16 (0.05, 0.27)	0.005
Digital Literacy	0.05 (-0.17, 0.27)	0.649
Faculty **Commerce/Law/Management** **Engineering** **Health Sciences** **Humanities** **Science**	 **(0) Reference** **-0.11 (-0.65, 0.42)** **0.08 (-0.46, 0.63)** **0.26 (-0.19, 0.72)** **0.07 (-0.49, 0.64)**	 **0.671** **0.769** **0.260** **0.804**
Year of Study	-0.00 (-0.19, 0.18)	0.975
Age	-0.01 (-0.03, 0.02)	0.705
Gender **Female** **Male** **Other**	 **(0) Reference** **-0.32 (-0.68, 0.05)** **-0.52 (-1.86, 0.82)**	 **0.087** **0.443**
Ulwazi Ease of Use Rating	0.12 (-0.05, 0.30)	0.172
Computer Skills Rating	0.18 (0.08, 0.27)	0.001
Ulwazi &Teams Limited Knowledge Rating	0.09 (0.01, 0.18)	0.032

4.4.1 *Results Pertaining to Research Question/Hypothesis 1*

H1. There is a positive association between blended learning and study habits.

Blended learning is the main explanatory variable in this hypothesis and the score is made up of 6 items on a seven-point Likert scale. The blended learning score had a Cronbach's alpha of 0.8405 (84% reliable), as seen in Table 7. The blended learning score had a mean score of 4.1, a standard deviation of 1.5, and a minimum and maximum of 1 – 7.

The original items were re-ordered to Strongly Disagree, Disagree, Somewhat Disagree, Neither Agree nor Disagree, Somewhat Agree, Agree, and Strongly Agree.

This was done such that the variable was ordered so that the composite score may be created. The original items were nominal (see Questions 16 and 18 in the previous section).

The multivariable linear regression model was utilised to carry out the analysis for this hypothesis. The unadjusted estimates have already been reported in the general section since all the hypotheses shared the same response variable. The results of the adjusted/multiple linear regression on the association between blended learning and study habits, shown in Table 9, indicate that blended learning is positively associated with study habits (Coefficient=0.12, 95% CI 0.01, 0.24). This means that for every unit increase in blended learning score, study habits increase by 0.12 on average. After adjustment, the blended learning coefficient decreased from 0.16 to 0.12 (a 25% decrease).

Computer skills had a positive association with study habits (Coefficient= 0.13, 95% CI 0.02, 0.23). This means that for every unit increase in computer skills rating, the study habits score increases by 0.13 on average.

Age and gender were not significantly associated with study habits.

Table 9: Adjusted/Multivariable linear regression analysis on the association between blended learning and study habits among Wits University undergraduate students, 2022 (n= 122).

Variable	Adjusted Coefficient (95% CI)	P-value
Blended Learning Score	0.12 (0.01, 0.24)	0.034
Age	-0.01 (-0.03, 0.03)	0.917
Gender **Female** **Male** **Other**	 **(0) Reference** **-0.17 (-0.51, 0.17)** **-0.39 (-1.64, 0.85)**	 **0.331** **0.531**
Computer Skills	0.13 (0.02, 0.23)	0.016

For the test of normality of the residuals for a linear regression model, using the graphical techniques for assessing normality, Figure 9 indicates that the probability

normal plot shows that there is no indication that the residuals are not normally distributed. The data does not deviate far from the straight line.

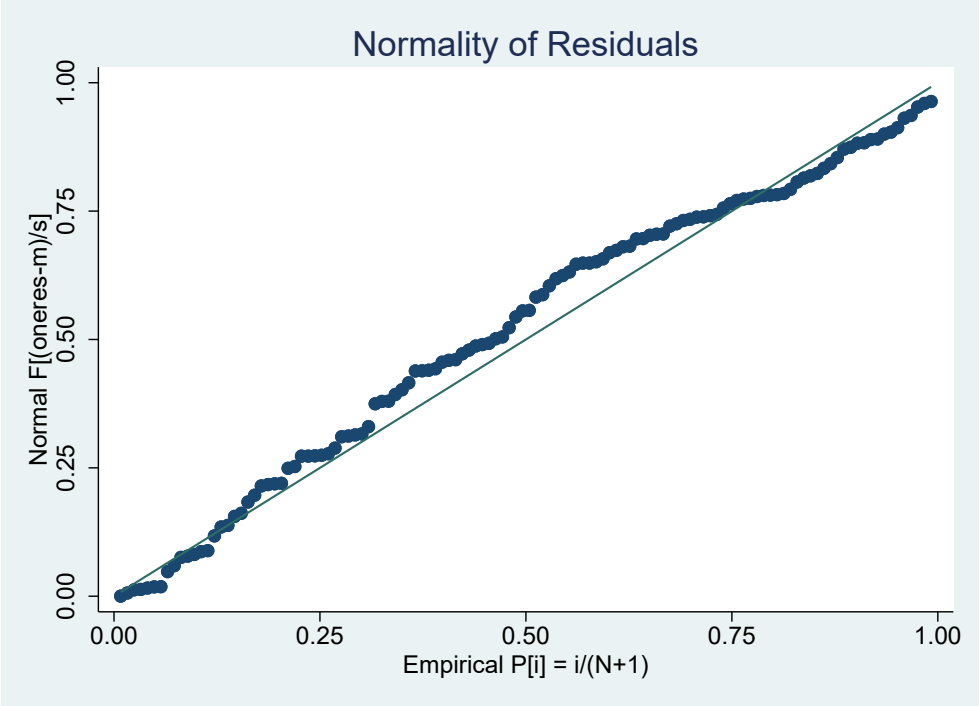

Figure 9 : Normality Assumption – blended learning and study habits

As far as the test for constant variance among the residuals, the scatter plot in Figure 10 shows that the studentised residuals and the fitted values do not have or are not scattered in a particular pattern. This shows that there is constant variance.

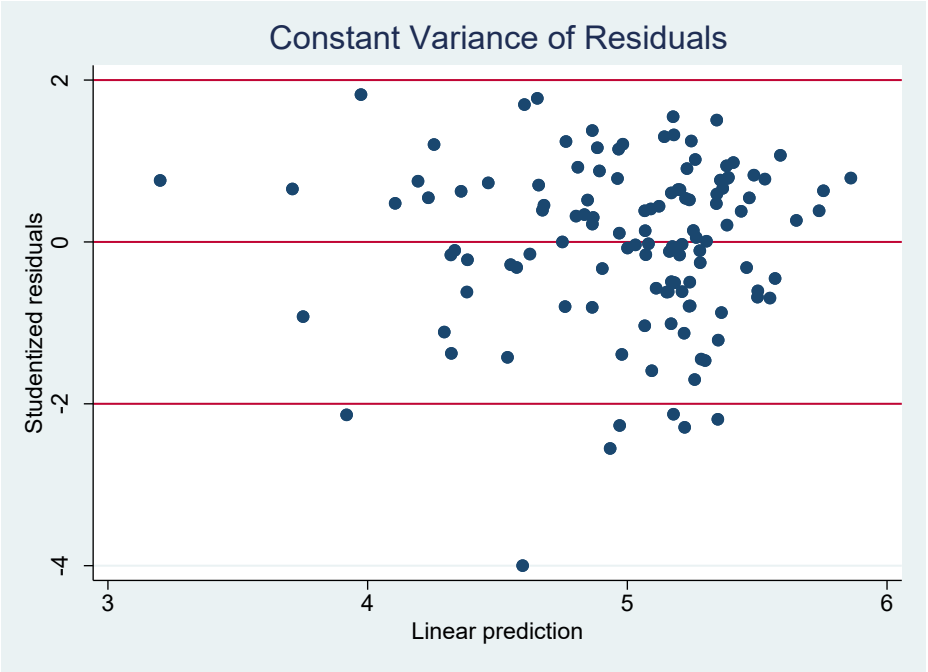

Figure 10 : Constant Variance Assumption – blended learning and study habits

4.4.2 *Results Pertaining to Research Question 2A/Hypothesis 2A*

H2.A. There is a positive association between digital literacy and study habits.

For hypothesis 2A, the response variable is study habits, and the main explanatory variable is digital literacy. Digital literacy refers to Question 6 in the survey questionnaire. Digital literacy was re-ordered to an ordinal variable: Excellent, Above Average, Average, Below Average and Very Poor. This was done so that the variable may be analysed as a quantitative variable.

The results of the multivariable linear regression, as shown in Table 10, on the association between digital literacy and study habits, indicated that there was some evidence of a positive association between digital literacy and study habits (Coefficient= 0.18, 95% CI -0.05, 0.4), However, this association is not statistically significant at the 5% significance level (p= 0.122). Gender, age, ulwazi and the Teams limited knowledge rating were also not significantly associated with study habits.

The Blended learning score (Coefficient= 0.13, 95% CI 0.01, 0.24) and the computer skills rating (Coefficient= 0.12, 95% CI 0.01, 0.22) are positively associated with study

habits. A unit increase in the blended learning score increases study habits score by 0.13 on average and a unit increase in the computer skills rating increases the study habits score by 0.12 on average.

Table 10: Adjusted/Multivariable linear regression analysis on the association between Digital Literacy and study habits among Wits University undergraduate students, 2022 (n= 122).

Variable	Adjusted Coefficient (95% CI)	P-value
Digital Literacy	0.18 (-0.05, 0.41)	0.122
Age	-0.01 (-0.03, 0.02)	0.723
Gender Female Male Other	 (0) Reference -0.15 (-0.49, 0.19) -0.28 (-1.52, 0.96)	 0.392 .0655
Blended Learning Score	0.13 (0.01, 0.24)	0.029
Computer Skills Rating	0.12 (0.01, 0.22)	0.030
Ulwazi &Teams Limited knowledge Rating	0.09 (-0.01, 0.18)	0.064

For the test of normality of the residuals for a linear regression model, using the graphical techniques for assessing normality, Figure 11 shows that the probability normal plot indicated that the residuals are normally distributed (approximately). The data does not deviate far from the straight line.

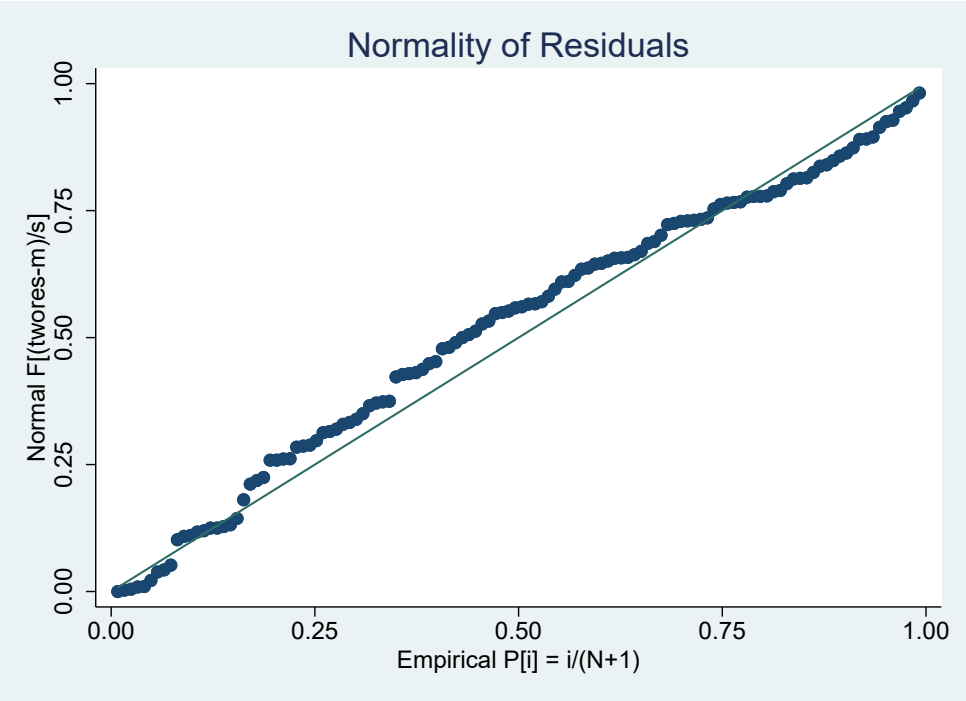

Figure 11 : Normality of Residuals – Digital Literacy and Study Habits

For the test for constant variance among the residuals, the scatter plot in Figure 12 shows that the studentised residuals and the fitted values do not have or are not scattered in a particular pattern: there is heteroscedasticity of residuals. This demonstrates that there is constant variance.

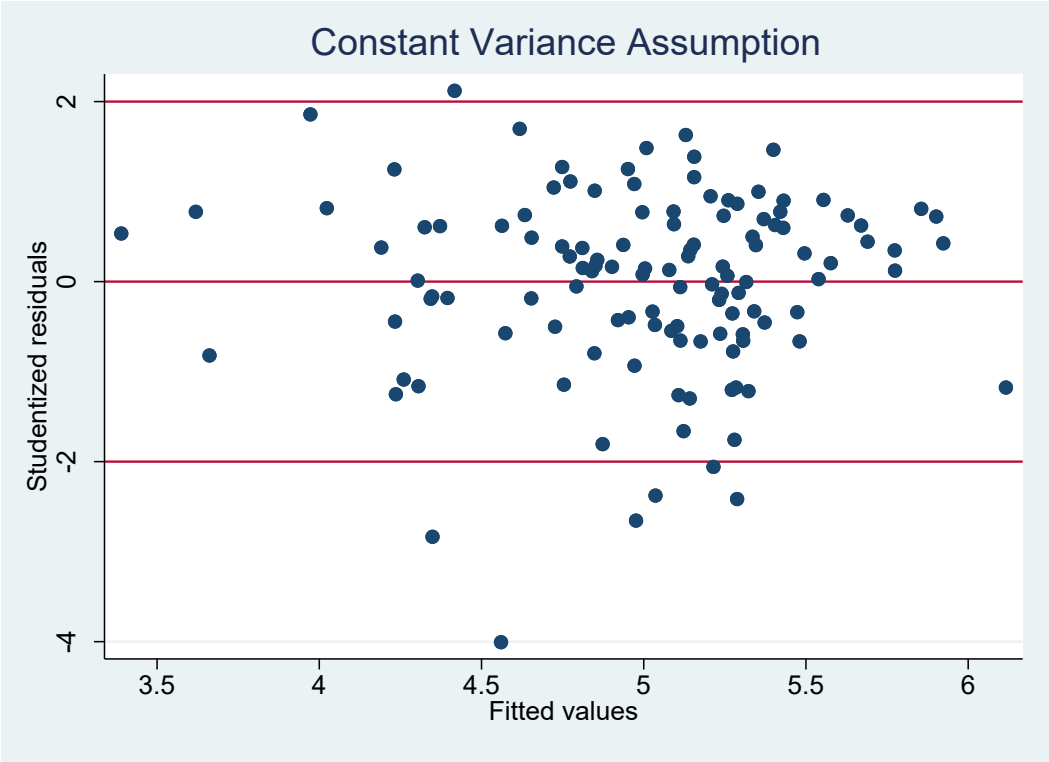

Figure 12 : Constant Variance – Digital Literacy and study habits

4.4.3 *Results Pertaining to Research Question 2B/Hypothesis 2B*

H2.B. There is a positive association between education experience (year of study) and study habits.

This hypothesis has two main explanatory variables of interest: year of study and field of study. Year of study is an ordinal variable with 4 levels: year 1 to year 4. Education experience as explained by the year of study is intuitive: a second year is expected to have more education experience compared to a first year and so on. Field of study (or faculty) is a nominal variable with 5 levels: Commerce, Law and Management, Engineering and the Built Environment, Health Sciences, Humanities, and Science. This variable explains the education experience in our sample.

A multivariable linear regression model was utilised to carry out the analysis for this hypothesis. The multivariable linear regression results, as shown in Table 11, on the association between education experience and study habits indicate that the field of study is not significantly associated with study habits. Though the associations in the

field of study are not significant, all associations are positive except for Health Sciences: which has a negative association.

Year of study is positively associated with study habits; however, the association is not statistically significant (Coefficient= 0.02, 95% CI -0.16, 0.21).

Both the explanatory variables (Year and field of study) which explain education experience are not statistically significant, however, there is some evidence of a positive association except for Health Sciences faculty which has some evidence of a negative association.

Table 11 : Adjusted/Multivariable linear regression analysis on the association between Education Experience and study habits among Wits University undergraduate students, 2022 (n= 122).

Variable	Adjusted Coefficient (95% CI)	P-value
Faculty		
Commerce/Law/Management	(0) Reference	
Engineering	0.16 (-0.39, 0.71)	0.560
Health Sciences	-0.02 (-0.58, 0.53)	0.931
Humanities	0.10 (-0.34, 0.55)	0.646
Science	0.05 (-0.51, 0.62)	0.850
Year of Study	0.02 (-0.16, 0.21)	0.823
Age	-0.00 (-0.03, 0.03)	0.890
Gender		
Female	(0) Reference	
Male	-0.19 (-0.56, 0.19)	0.323
Other	-0.49 (-1.86, 0.89)	0.487
Computer Skills Rating	0.12 (0.01, 0.23)	0.027
Blended Learning Score	0.13 (0.01, 0.25)	0.029

For the test of normality of the residuals for a linear regression model, using the graphical techniques for assessing normality, Figure 13 shows that the probability normal plot shows that there is not enough evidence that the residuals are not normally distributed. The data does not deviate far from the straight line.

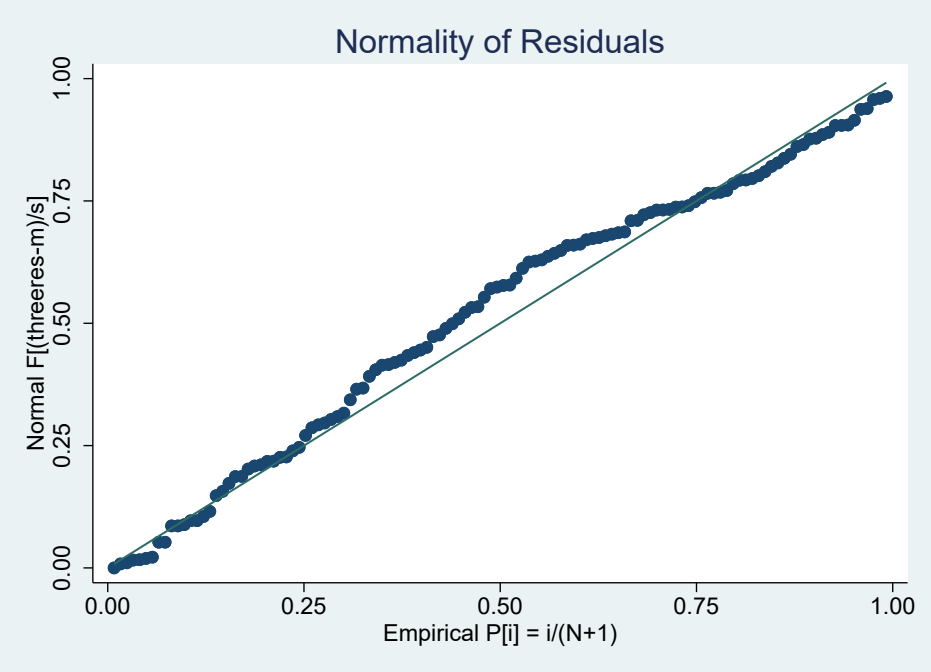

Figure 13 : : Normality of Residuals – education experience and study habits

For the test for constant variance among the residuals, the scatter plot in Figure 14 shows that the studentised residuals and the fitted values do not have or are not scattered in a particular pattern. This shows that there is constant variance.

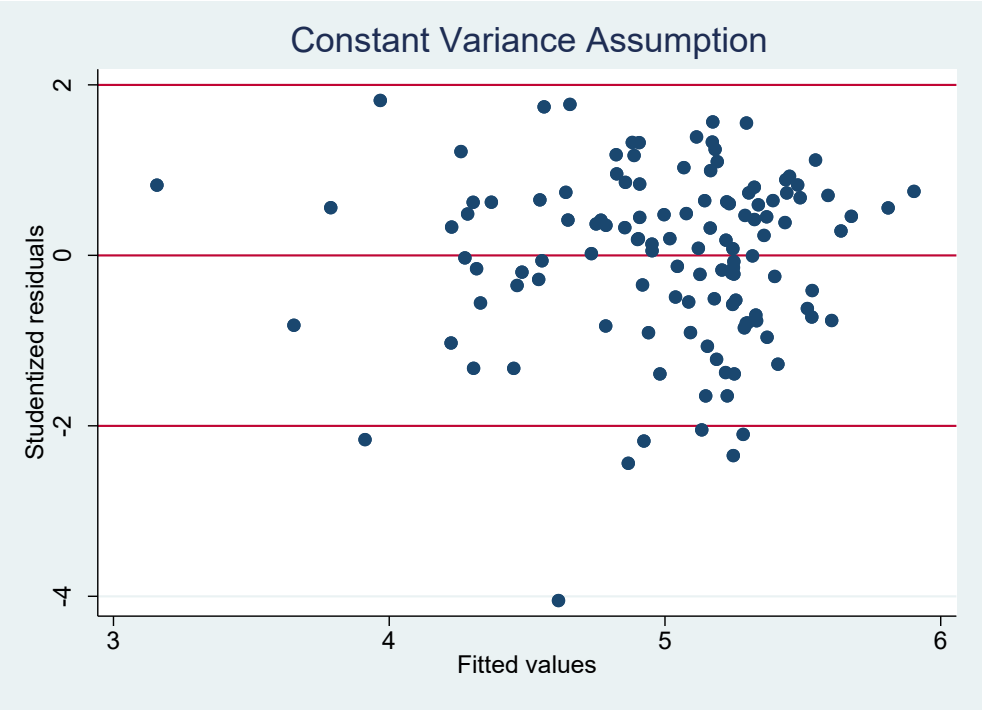

Figure 14 : Constant Variance – education experience and study habits

4.5 Summary of results

The results were analysed and presented along the lines of the research questions. The results presented confirms the positive relationship between blended learning and study habits (Hypothesis H1) through the multivariate linear regression model test that was carried out. The regression model test was also conducted for the outcomes of Hypothesis H2A “Is there a positive association between digital literacy and study habits?” and H2B “Is there a positive association between education experience and study habits?” and demonstrated a positive mediating association with study habits although not statistically significant.

CHAPTER 5. DISCUSSION

Although the literature reviewed included studies on blended learning and its impact on student performance, few studies seem to have investigated the relationship between study habits and blended learning in a South African higher education context. This is particularly important in a post-pandemic context. This study pursued the aim to ascertain the relationship between blended learning and study habits and to what extent study habits are influenced further by learner characteristics such as education experience and digital literacy. The student characteristics such as age, year of study, digital literacy, attitude towards learning, as per the theoretical framework (Draffan & Rainger, 2006) in Figure 1 in Chapter 2, provided a basis for the analysis.

5.1 Research Question 1: Blended Learning and Study Habits

Is there a positive association between blended learning and study habits?

An understanding of whether there is an association between blended learning and study habits provides university staff and students with insights on how to adapt to a changing learning environment and provides the university with insights on how to support student learning experiences post-COVID. This question aims to find the direct association blended learning has on students' study habits.

Simple linear regressions results

The overall result of the unadjusted/simple linear regression models on all factors associated with study habits indicated that blended learning was positively associated with study habits (Coefficient= 0.16, 95% CI 0.05, 0.27). This means that for every unit increase in blended learning score, study habits score increases by 0.16 on average.

Multivariable linear regression outcome

The results of the adjusted/multiple linear regression on the association between blended learning and study habits indicated that blended learning was positively associated with study habits (Coefficient=0.12, 95% CI 0.01, 0.24) further confirming the first simple linear regression model.

Some respondents provided open comments on the impact of blended learning on their study habits in the comments section of the survey. Aligned to the hypothesis, the comments seem to indicate that many students' study habits were positively influenced due to the blended learning environment for the betterment of their studies. But they also indicated mixed preferences for blended learning (discussed below). The findings also indicate students had the opportunity to review their ways of working or learning and adapt their study habits to the blended learning environment to continue their learning journey.

The positive comments support Bouilheres et al. (2020) finding that students learning opportunities are positively impacted by blended learning. The students' views expressed in this study supports Kim's (2012) finding that a student's view of blended learning is critical to achieving the advantages of blended learning since these impressions can be used to develop a more accurate and extensive plan for satisfying a student's academic objectives. However, the general comments indicated mixed preferences for blended learning in comparison to face-to-face learning. Similarly, Sharma et al. (2022) found that some students preferred offline learning supported by effective learning tools that enable them to refer to study material during their private study time.

The following quotations support the finding of a positive association between blended learning and study habits. These respondents particularly highlighted how blended learning affected study habits related to time management and test strategies. The comments indicate that blended learning provided more flexibility for students.

> Time management – *"I had to adapt, I had to self-manage, and with a little help from others, I did. Blended learning may save time to travel to class and is less tiring. Traditional in person is hard because I haven't learned to maximise my in-class learning".*
>
> *"Blended learning made it easier to work and study"*
>
> Test strategies – *"Blended learning definitely reduced my studying with understanding and ability to express it and aimed it more to repeating information in the short term".*

“I think because of blended learning and it creating an environment for us to receive notes from lecturers and videos for later referral was very helpful and an essential part of why I was able to do as well as I did compared to if I did not have these additional resources”.

From this study, the results indicate that there is a positive association of technology factors like the computer skills rating, the ulwazi and Teams limited knowledge rating, and the ulwazi ease of use rating with study habits. This positive association confirms the finding by Czerniewicz et al. (2020) that technology navigation skills and computer skills are key skills to the success of a blended environment.

A quantitative study by Nguyen (2017) found that greater interaction between students and tutors has a positive impact on the learning process in blended learning scenarios which is confirmed by this study. Ntim et al. (2021) found supporting evidence that blended learning can overcome the physical and geographical barriers that exist with face-to-face learning and encourage a self-paced and critical learning approach for students.

While the study found a positive association between blended learning and study habits, however, some students also provided comments indicating that blended learning was not their preferred mode of studying. This highlights that students have different preferences for modes of provision, and this can affect how they approach their studies. For example, these students commented:

“For me, in-person learning is superior to online or blended learning in more or less every way. Studying online made it harder to engage with the material, harder to retain information long-term, and close to impossible to interact with fellow students, tutors, or lecturers.”

“There are also challenges with regards to psychologically since there is not much contact between peers and between the lecturer/tutor and there often is a problem with time management and class attendance since there is no physical venue to be present at. Overall, I feel that full in-person study is the best option.”

These comments are supported by Armellini et al. (2021), who found that students place more value on regular interactions amongst themselves, lecturers, and the actual learning material than the learning environment or mode. The negative comments about blended learning also relate to study habits associated with motivation and procrastination challenges:

> Motivation – *"Motivation and staying up to date has been harder online than when fully in person."*
>
> Concentration and memory – *"Blended learning especially on the side of online has only increased my level of procrastination which was not useful."*

These findings are supported by Hartwig and Dunlosky (2012) who conducted a study on self-testing and related student academic achievement and found that most students prioritise their studies according to what is most urgent for submissions, study late at night, and do not allocate sufficient time for studying. The findings also indicate students have different preferences for modes of learning. Mali and Lim (2021) found that students preferred face-to-face learning rather than blended learning especially when there was no health/life risk for face-to-face interactions (such as during the COVID-19 pandemic).

5.2 Research Question 2A: Digital Literacy and Study Habits

Is there a positive association between digital literacy and study habits?

An understanding of whether there is an association between digital literacy and study habits in a blended learning environment is important for the university to be aware of how to support students appropriately and to create the learning and technological environments that support the needs of students. It also means that students must be oriented and supported to develop the required digital literacy skills to be able to succeed in their studies.

Multivariable linear regression outcome

The results of the multivariable linear regression on the association between digital literacy and study habits, indicated that there was some evidence of a positive

association between digital literacy and study habits (Coefficient= 0.18, 95% CI -0.05, 0.4), However, this association is not statistically significant at the 5% significance level (p= 0.122).

Gender, age, and the ulwazi and Teams limited knowledge rating were also not significantly associated with study habits. The blended learning score, the computer skills rating, and the ulwazi and Teams rating were positively associated with study habits.

Though the results are not statistically significant it was noted that participants only selected three of the five possible responses to the digital literacy question which demonstrated a stronger digital literacy measure within the sample. None of the respondents assessed their digital literacy skills as below average or very poor. There were no notable comments that were provided by students related to digital literacy in the open question. While Du Preez and Le Grange (2020) found that digital literacy is an important factor given the inequality levels in South Africa, the results of this study seem to demonstrate that this factor is not statistically significant for this sample.

Ssekakubo et al. (2012) noted that LMS platforms need to be designed for efficiency to facilitate a blended learning environment. This is supported by the positive association of blended learning with the Computer skills rating, the Ulwazi and Teams rating, and the Ulwazi ease of use rating in the results of this study.

5.3 Research Question 2B: Education Experience and Study Habits

Is there a positive association between education experience and study habits?

An understanding of the association between education experience (year and field of study) and study habits is required to enable the university to cater to the needs of diverse students studying in different disciplines and at different levels.

Multivariable linear regression results

The multivariable linear regression results on the association between education experience and study habits indicate that the year and field of study is not significantly associated with study habits (Coefficient= 0.02, 95% CI -0.16, 0.21).

Whilst both explanatory variables (Year and field of study) which explain education experience are not statistically significant, there is some evidence of a positive association except for respondents from the Health Sciences faculty. Computer skills and blended learning are positively associated with study habits and both these associations are statistically significant.

Alzahrani & O'Toole (2017) found that year of study, age, and attitude towards the Internet influenced students in a blended learning environment. This contrasts with the results of this study as the variables (year of study, age, and attitude towards the Internet) tested demonstrated a statistically insignificant impact on study habits. The reason for the differences could related to different regions, cultures, and periods in which the studies were done (the Alzahrani & O'Toole study was pre-pandemic).

5.4 Infrastructural Factors

While this study did not focus on the infrastructure and ICT factors that enable blended learning environments, it must be noted that these factors can affect both study habits and blended learning experiences. Singh et al. (2021) found that appropriate infrastructure is key to ensure effective learning experiences for all stakeholders involved in the learning process to support blended learning success. Therefore, this study will discuss some of the infrastructural factors that emerged from respondent comments that could be included in future studies.

Several comments from respondents related to the factors that facilitate a blended learning environment such as electricity availability and internet access. With continued electricity demand exceeding supply, the Eskom "load shedding" challenge is expected to continue for several years in South Africa. This has affected both personal and professional lives as businesses suffer continued losses due to outages and require expensive alternative power sources to continue operations (Erero, 2023). Muller (2023) noted that whilst steps have been put in place to reduce load shedding, the solution to end load shedding is still far off and requires political, technical and

managerial integration to function effectively. This undoubtedly affects study habits as well as indicated in the comments by students below:

> ICT – *"I feel that blended learning is not always ideal due to limited resources such as internet connectivity or data access, and access to devices that enhance or accommodate the blended learning experiences. It is very difficult to maneuver around a laptop that only works when it is charging when there is load-shedding or one that is very slow and limits your access to online classes on time, and so forth…"*
>
> Eskom Load-*Shedding- "The blended learning approach made me more aware of the Eskom load-shedding. It will be fine to have tutorials and examination preparation on a face-to-face basis."*
>
> *"I have found that with regards to online learning, it has far too many challenges both physically in terms of data, network strength, and issues such as load-shedding."*

These variables (ICT infrastructure, load shedding) were not directly addressed in this study and could be the focus for future study, particularly the impact of load shedding on study habits.

5.5 Summary of the Discussion

The main aim of the study was to investigate the relationship between blended learning and study habits for undergraduate students at a South African University in a post-pandemic context. The data analysis of the study has shown that there is a statistically significant and positive association between blended learning and study habits. The results also demonstrate that the mediation effect of learner characteristics (education experience and digital literacy variables) on study habits is positive yet not statistically significant. An area for future study has been identified as the impact of load shedding on blended learning and study habits.

CHAPTER 6. CONCLUSION

6.1 Summary of Findings

The research aims to contribute positively to the body of knowledge by providing insights into changes in students' study habits in a blended learning environment as South African universities emerge from the effects of the COVID-19 pandemic. These insights will assist the particular university studied to better prepare for learning and teaching in different formats and modes and assist students to transition smoothly to a blended learning environment. This study also contributes to the body of knowledge about the relationship between study habits and blended learning in a South African higher education context. Given the likely increased adoption of blended learning post-COVID-19 pandemic, the relationship with study habits is important for considering how blended learning is designed and how students engage with learning resources, activities and assessments during their learning journey.

This study investigated the dynamics of blended learning and what study habits are used for blended learning by undergraduate students. Research question one investigated whether there is a positive association between the blended learning and study habits variables. The study confirmed in the sample that blended learning has a positive association with study habits.

Research question two consisted of two parts. The first hypothesis (2A) investigated whether there is a positive association between digital literacy and study habits. The outcome of the research confirmed the positive association. The second hypothesis (2B) investigated whether there is a positive association between education experience and study habits. The outcome of the research confirmed the positive association. Although the study confirmed the positive association for hypotheses 2A and 2B, they were not found to be statistically significant through the mediation principle.

6.2 Implications

The study revealed that students' digital literacy is at a high level at the university, evidenced by the fact that respondents did not evaluate themselves as "below average" or "very poor" on the 7-point Likert scale provided. This is a positive indicator for further blended learning adoption by the university emerging from the pandemic. This finding does need to be approached cautiously due to the self-reported nature of digital literacy skills. At the same time, this finding still needs to be considered alongside the ongoing need for students to be oriented and supported in any technologies that are required to be used in a blended learning environment.

Some of the major study habits that are affected by the blended learning environment for students include motivation, time management, and test strategies. In the main, adapting to change has been a key factor as students are expected to adapt to different learning environments while continuing with their academic programmes. While this may not require the haste in which universities in South Africa had to adapt to COVID-19 and ERTL in 2020, the implication of this finding for the university is to provide guidelines for studying in a blended environment and support students to develop successful study habits. Additionally, the university will need to consider not just how to provide academic support in a blended environment, but also how technological, emotional, and psychological support is provided to students to manage the different requirements and integrations between online and face-to-face learning components.

The LMS plays an important role in students' adoption of a blended learning environment. In this study, most students found the University LMS easy to use for their learning experiences. Furthermore, open comments from students indicated that the platform contributed to their positive blended learning experience and test strategies by reducing study and preparation time and improving their ability to review their learning through watching recordings.

ICT infrastructure availability and Eskom load shedding were found to be underlying negative aspects that limit the adoption or success of blended learning. Students highlighted their inability to attend certain classes due to load-shedding and at times were unable to access recorded lectures due to insufficient data and out-of-battery devices. The findings indicate that data and devices are important tools needed to

enable blended learning. Therefore, a recommendation from this study is that University management could consider additional data support and ICT infrastructure access for students as well as guidelines for students and staff in adapting to load shedding.

6.3 Limitations and suggestions for further research

The study was carried out with undergraduate students from the University of the Witwatersrand, Johannesburg, South Africa. Fewer respondents than expected contributed to the study because it was conducted during March 2023, a time when most students are settling into the new academic year. Therefore, a limitation of this study is that the findings may not be generalisable. Additionally, as the university learning and teaching strategy moved towards blended learning in 2022 (Wits University, 2021b), recreating this study in future (once blended learning is more institutionalised in the university) may lead to different results regarding blended learning and study habits.

Further research could be extended to undergraduate and postgraduate students at different South African universities to consider similarities and differences in blended learning experiences and study habits. The study could also be undertaken in other African universities or universities in countries that face similar contextual challenges such as limited ICT infrastructure and power. The study did not consider Eskom load-shedding as a variable, this is a potential area of future study to investigate how load shedding affects study habits and blended learning. Additional survey factors could be included that probe the impact of intermittent power outages on the blended learning experience for students.

This study was undertaken quantitatively to collect data. Future studies could be undertaken that are qualitative in nature (interviews or focus groups) to expand or add to these findings. Going beyond the academic focus, further studies could also be done to investigate the interplay between blended learning and the effectiveness of holistic university support systems in terms of emotional, psychological, and technological support for students.

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APPENDIX A: Survey Questionnaire

Section	No	Question	Response Options
Question 1-7 Demographics	1	What is your age?	Enter age (number)
	2	What is your gender?	Drop-down: Male, Female, Other
	3	Race	Drop-down: Black, Coloured, White, Indian, Other
	4	Faculty	Drop-down: Commerce, Law, & Management, Engineering, Health Sciences, Humanities, Sciences
	5	Field of Study	Drop-down: Accountancy, Business Sciences, Economics and Finance, Law, Architecture and Planning, Civil & Environmental Engineering, Chemical & Metallurgical Engineering, Construction Economics & Management, Electrical & Information Engineering, Mechanical, Industrial & Aeronautical Engineering, Mining Engineering, Anatomical Sciences, Clinical Medicine, Oral Health Sciences, Pathology, Physiology, Public Health, Therapeutic Sciences, Wits School of Arts, Wits School of Education, Human and Community Development, Literature, Language and Media, Social Sciences, Animal, Plant and Environmental Sciences, Chemistry, Computer Science and Applied Mathematics, Geography, Archaeology and Environmental Sciences, Geosciences, Mathematics, Molecular and Cell Biology, Physics, Statistics and Actuarial Science
	6	Year of Study	Drop-down: 1st,2nd, 3rd, 4th
	7	General Digital Literacy Skills	Drop-down: Excellent, Above Average, Average, Below Average, Very Poor

			Strongly Agree	Agree	Somewhat Agree	Neither Agree or Disagree	Somewhat Disagree	Disagree	Strongly Disagree
Question 8 Time management	8.1	I schedule study times and outline specific goals for my study							
	8.2	I give sufficient study time to each of my courses in a blended learning environment.							
Question 9 Concentration and memory	9.1	I am satisfied with the level of concentration I am able to maintain in when studying.							
	9.2	I find that I am able to concentrate - that is, give undivided attention to							

			Strongly Agree	Agree	Some-what Agree	Neither Agree or Disagree	Some-what Disagree	Dis-agree	Strongly Disagree
		the task for at least 20 minutes at a time.							
Ques-tion 10 Note taking	10.1	While I am taking notes I think about how I will use them later.							
	10.2	I organise my notes in some meaningful manner (such as outline format).							
Ques-tion 11 Test strat-egies	11.1	I begin preparing for major assignments, tests or exams well in advance.							
	11.2	I am calmly able to recall what I know during a test or exam.							
Ques-tion 12 Organis-ing and process-ing inform-ation	12.1	I try to organise facts in a systematic way.							
	12.2	I solve a problem by focusing on its main point.							
Ques-tion 13 Moti-vation	13.1	I attend class regularly (either face-to-face or online).							
	13.2	I volunteer answers to questions posed by lecturers/tutor s in lectures or tutorials.							
Ques-tion 14 Reading	14.1	When reading, I can distinguish between important and not important points.							
	14.2	When learning a unit of material, I try to summarise it in my own words.							

			Strongly Agree	Agree	Some-what Agree	Neither Agree or Disagree	Some-what Disagree	Dis-agree	Strongly Disagree
Ques-tion 15 Writing	15.1	For assignments, I write rough drafts then rewrite or refine it.							
	15.1	I am comfortable using library resources (online or in person) for research.							
Ques-tion 16 Interact-ion	16.1	Blended learning has improved my interaction with fellow students.							
	16.2	Blended learning has improved my interaction with my lecturers/tutors.							
Ques-tion 17 Using tech-nologies for learning	17.1	I was able to learn how to use Canvas (ulwazi) quickly							
	17.2	I find Canvas (ulwazi) easy to use							
	17.3	I am able to access content and activities on Canvas (ulwazi) without any problems							
	17.4	My computer skills have improved as a result of blended learning							
	17.5	I felt that my knowledge regarding using technology such as Canvas (ulwazi) and Microsoft Teams was limited compared to my peers							
Ques-tion 18	18.1	I am in favour of incorporating							

			Strongly Agree	Agree	Some-what Agree	Neither Agree or Disagree	Some-what Disagree	Dis-agree	Strongly Disagree
Blended Learning		blended learning in my studies							
	18.2	Blended learning encouraged me to learn							
	18.3	Blended learning is less stressful than traditional in-person learning							
	18.4	Blended learning is more effective than traditional in-person learning							
Ques-tion 19 General Commen ts	19	Any general comments to add about study habits or blended learning?	(Open question)						

APPENDIX B: Participant Information Sheet and Consent Form (Email)

Dear Wits Student,

My name is Langa Dube, and I am a Master's student in Digital Business at the University of the Witwatersrand, Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating the study habits of undergraduate students for blended learning at a South African university under the supervision of Dr Greig Krull. This research aims to find out what study habits are used for blended learning. The study title is "Investigating the study habits of undergraduate student during blended learning at a South African University".

As part of this project, I would like to invite you to participate in an online survey. If you decide to take part, your participation in this research study will take about 15 minutes. Please click on the link to access the survey: ((survey link))

The confidential data will be stored in a password-protected computer and deleted after 7 years. The online survey will be confidential and anonymous. Only the researcher and supervisor will have access to the data. When I share the results of the research study, I will not include your name or anything else that could identify you.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. Please note that by submitting the completed questionnaire you are giving your consent to participate. The risks for this research study are no more than what happens in everyday life. This research study will be written up as a research report.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za

Thank you

Researcher: Langa Dube, 0318879g@students.wits.ac.za

Supervisor: Greig Krull, greig.krull@wits.ac.za

APPENDIX C: Survey open question comments

Theme	Comments
Positive association blended learning Study habits	“Blended leaning #forgood “ “Blended learning definitely reduced me studying with understanding and ability to express it, and aimed it more to repeating information in the short term” “Blended learning is the way to go.” “Blended learning left me with more time to spend on studying/assignments/procrastinating by reducing how often I needed to commute 45-60 minutes to and from the university. “ “Blended learning made it easier to work and study “ “Blended learning requires discipline and time management” “Blended learning showed us that we can learn independently but that we should also appreciate the time we go to class in person because as humans we are still a social species.” “Blended learning works very well in circumstances that do not allow people to physically attend class but in person learning allows for more interaction and higher levels of concentration than just watching a video or listening to an online session” “I had to adapt, I had to self manage, and with a little help from others, I did.” “Blended learning may save time to travel to class and is less tiring. Traditional in person is hard because I haven't learned to maximise my in class learning.” “I learned to be consistent and the importance of time management and not try to multitasking “ “I somewhat felt like blended learning helped me to manage my time when better. ““I just had more time on my side. Having to wake up early everyday to prepare for class is really time consuming, I could literally just log in to class digitally, Time saved!” “I think because of blended learning and it creating an environment for us to receive notes from lecturers and videos for later referral was very helpful and an essential part of why I was able to do as well as I did compared to if I did not have these additional resources.” “I'm traditional learning due to the fact that at as the year goes by you forget what you learnt the first few weeks but with online learning the recordings were saved which you can refer back them to remind yourself.” “It's so effective to part time post graduates who are also working. I have attended all my online classes. No interruptions due to traffic like attending face to face” “Keeping your own schedule and times because recorded lectures allowed you to do so added a bit of freedom to studying and was less stressful. It also taught me responsibility.” “My time management improved.” “Online learning made it harder to interact with lecturers, tutors and especially fellow classmates. However, it helped me develop organizational skills. “ *“As much as Blended learning has its advantages, it becomes a major con when we are taught online and required to take tests in person, it becomes an anxious activity for students. As much as it has its cons it's also advantageous because it allows students to grasp information and the material at a pace they are comfortable with.”*

Theme	Comments
Negative association blended learning Study habits	“Blended learning especially on the side of online has only increased my level of procrastination which was not useful.” “Blended learning only works when the facilitation of it is effective. When a lecturer misuses their time in person or online or give poor resources for online it decreases the efficacy of the blended learning concept” "Either full online or in person full time. Preference for online full time as can work at own pace and more effectively. Blended learning is more stressful and ineffective as waste time traveling to campus for in person the Can NOT find suitable place for online lecture as libraries have insufficient plug points. Further can not use lecture or tut venues as they are in use. Only advantage of campus is access to generators , wifi and can consult lecturers." “For me in-person learning is superior to online or blended learning in more or less every way. Studying online made it harder to engage with the material, harder to retain information long-term and close to impossible to interact with fellow students, tutors or lecturers.” “I find that having a timetable of where I have to attend class physically allows me to better plan my day or week well in advance. I can schedule study sessions at quite environments like libraries better if I have a class on campus. Also, live lectures allow me to identify what areas the lecturer puts emphasis on. In conclusion, Live face to face lectures are better.” “In person learning is far better than blended.” “It is still very difficult for me to adjust to blended learning, but it is ironically convenient to access resources” “Motivation and staying up to date has been harder online than when fully in person. “ “Online learning increases one's laziness and more procrastination than doing the job. People cheat more during online learning, resulting in a lack of knowledge and will probably affect one's studies the following year when it's no longer online. Online lectures such as through BBB and MS Teams often had connection issues. Pre recorded lectures were nice because you could listen at your own pace and more than once, however, I find that in person lectures help me with routine and keep me up to date. I find in-person interaction more valuable than virtual but there are benefits to both. Emoji reactions in teams is nice. “ "Personally I prefer face2face class. I fall asleep sometimes during online classes. It is hard to maintain focus when you are accountable to yourself and no productive distraction, like a classmate to engage with in order to keep awake.” “I am a part time student." “The experience of blended learning contributed to less engagement and cohesive learning, in terms of concentration and free flowing interactions with peers. Discussion platforms on Ulwazi provide a medium for this yet responses and engagement improved with face-to-face learning. Furthermore, finding a note-taking and organization tool is challenging, as online notes provide accessibility, but less engagement. Yet, this is subjective to each person and how notes are utilized. “ “The pitfall of online studying is the distractions at home and the inability to distinguish between a study environment and home environment (i.e. never switching off). This is in my personal experience.” “*Based on my own experience, For people with ADHD online classes suck because they can't concentrate on the lecture (especially if they are at home) Being at the lecture face to face forces them to stay mostly focused* *However, it is nice to be able to have the recorded videos for revision or to be able to catch up a missed lesson*”

Theme	Comments
Infrastructure factors affecting blended learning overall	“I feel that blended learning is not always ideal due to limited resources such as internet connectivity or data access, and access to devices that enhance or accommodate the blended learning experiences. It is very difficult to maneuver around a laptop that only works when it is charging when there is loadshedding or one that is very slow and limits your access to online classes on time, and so forth. With receiving narrated slideshows or videos and the like - it is often overwhelming when you are expected to watch lecture videos for over an hour which makes it difficult to grasp concepts because making summary notes while watching takes up a lot of time on its own. “ "I have found that with regards to online learning, it has far too many challenges both physically in terms of data, network strength and issues such as loadshedding. There is also challenges with regards to psychologically since there is not much contact between peers and between the lecturer/tutor and there often is a problem with time management and class attendance since there is no physical venue to be present at. Overall I feel that full in-person study is the best option. " "Online learning and in person learning both have their own pros and cons. It is difficult to decide which was better. Online was convenient and allowed us flexibility but didn’t allow us to interact properly, affected by loadshedding and affected mental health in that we were always in our rooms the whole day. Recorded lectures were very helpful to rewatch. No need to travel to university. In person allows better interaction and loadshedding/wifi wasn’t an issue. No recordings mean if you miss something you miss out. I think in person is better for mental health. " "The blended learning approach made me more aware of the Eskom load-shedding. It will be fine to have tutorials and examination preparation on a face-to-face basis.” "