Undergraduate Students' Perceptions of the Use of Online Examinations in an Open and Distance Learning Environment

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Abstract

This phenomenological study explored undergraduate students' perceptions of the usefulness and ease of using online examinations in relation to the practicality and security of those who enrolled for Teaching Mathematics in the FET Phase. The perception theory, which outlines positive and negative perceptions, was used to underpin this study. An interpretive paradigm was also used as the study employed a phenomenological qualitative research design. The study generated data from 12 students who participated in semi-structured telephone interviews. The findings of the study revealed both positive and negative perceptions of online examinations. Positive perceptions that made online examination pleasurable were cost saving and saving on travel time, writing at one's own pace and space, submitting answer sheets online, getting immediate feedback, and writing online and offline. On the other hand, negative perceptions included difficulties in using the Invigilator App, noise pollution, network connectivity, and load shedding. The study suggests that students identify spaces where they can easily access a stable internet network with no noise pollution.

Keywords: electronic devices; online distance learning (ODL); online examination; students' perceptions

Introduction

The online examination, commonly known as take-home examination (THE), is used to conduct examinations using technological devices such as computers and mobile phones. THE can take place anywhere: at home, in an office, or at an examination centre. THE has different forms and can include paper-based assessments. The Covid-19 pandemic and lockdowns compelled most higher education institutions (HEI) to

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embark on the facilitation of online examinations, and the University of South Africa (Unisa) was no exception. In this regard, THE is an assessment where the question paper is downloaded, completed offline and resubmitted online by uploading the answer sheets. The online distance learning (ODL) environment is proctored, and students have up to four hours to complete the examination offline and upload the answer sheets before the examination expires. This study reports on undergraduate students' perceptions of using online examinations in the Department of Mathematics Education at Unisa.

Take-home examinations have gained traction within the HEI sector (Adanir et al. 2020; Elgalil et al. 2022; Eurboonyanum et al. 2020; Ilgaz and Adanir 2020; Shraim 2019). Eurboonyanum et al. (2020) add that THE is an assessment and evaluation method used at HEI. Nicol (2007) states that THE can supplement or replace paper-based tests. Currently, THE is recognised as an efficient method for assessment that benefits both students and the learning process (Adanir et al. 2020). According to Karim and Shukur (2016), THE is an important component of online course delivery. Shraim (2019) shows that for effective implementation of THE, examinations should be designed to be valid, reliable, secure and flexible. Sarrayrih and Ilyas (2013) argue that using venue-based examination brings about a heavy burden for students and lecturers, and THE provides solutions to these issues. Ilgaz and Adanir (2020) maintain that THEs are more efficient, usable and reliable than conventional venue-based examinations.

According to the Joint Implementation Supervisory Committee (JISC) (2010), THE can improve the effectiveness of data management system tasks, including storing information, marking and moderating. The JISC further indicates that THEs reduce workload by eliminating activities such as invigilation. The advantages of THE include cost effectiveness, test security, automated record-keeping for item analysis, secure data storage, quick results, paper savings, and time reduction (Nguyen et al. 2017). Alsadoon (2017) maintains that using THE provides immediate feedback and unbiased grading. Identified advantages include sufficient examination duration when compared to traditional closed-book examinations. Nevertheless, the identified drawbacks of THE include technical challenges, assistance from third parties, and fatigued students due to prolonged use of technological tools (Ilgaz and Adanir 2020). Elgalil et al. (2022) identified more drawbacks, such as a lack of concentration and the high cost of connectivity.

Prior to the implementation of THE, HEIs practised the traditional closed-book examination/in-class exam (ICE), which is done by using pen and paper and is proctored (Bengtsson 2019). According to Williams and Wong (2009), ICEs minimise the risks of the exams being compromised by unethical student behaviour and also avert students from superficial learning. THE is unsuitable for assessing students' performance on the higher levels of Bloom's taxonomy scale 7–9; it imposes unnatural pressure on the students and does not promote students' generic skills and knowledge (Williams and Wong 2009).

Unisa implemented THE for the first time in October/November 2020 with the undergraduate student cohorts during the Covid-19 pandemic. The pandemic negatively impacted the economy, and the education sector was no exception (Ashri and Sahoo 2021). During the pandemic, HEIs worldwide resorted to e-learning and THEs (Strielkowski 2020). According to Ashri and Sahoo (2021), the advent of the virus forced the education sector to restructure students' performance evaluation systems, redesign curricula and reinvent the teaching-learning process. As such, this study was undertaken to understand undergraduate students' perceptions of the usefulness and ease of use of THEs.

According to Shraim (2019), THE was implemented prior to the pandemic in SA and other parts of the globe to supplement or replace venue-based examinations. THE is a technological answer to conducting examinations and can take place anywhere (Ayo et al. 2007). Most HEIs embarked on THEs due to the Covid-19 pandemic and lockdowns. Shraim (2019) states that THE improves the robustness of test results, supports deeper analysis and improves scoring reliability. It also reduces the burden associated with invigilation, attempts to correct errors, and provides immediate feedback (JISC 2010).

THEs are increasingly implemented in South African universities, and attention is given to their usefulness, practicality and ease of use. However, little attention is given to security. THE is an exam that students write in their own spaces; it is physically not invigilated, and the time allocated can be extended (Bengtsson 2019). The disadvantage is that academic integrity can be compromised when the exam is not secured (Bengtsson 2019). Therefore, this study explores the undergraduates' perceptions of the usefulness, ease of use and implementation of THE at Unisa's Department of Mathematics Education. The findings of this study will help the university to identify important and strategic aspects of the effective design and setting of THEs to support students' learning.

1. What are undergraduate students' perceptions regarding the usefulness and ease of use of take-home examinations (THEs) in relation to practicality and security?
2. What are the main challenges to implementing take-home examinations (THEs) in HEIs in ODL?

Literature Review

Students' Perceptions of the Use of THE

Students' perceptions are important in designing and managing the successful implementation of THE, and several studies have investigated this. According to Eurboonyanum et al. (2020), students are generally satisfied with the implementation of THE. Adanir et al. (2020), in a study conducted in Turkey and Kyrgyzstan, found THE to be less stressful, more reliable and fairer than venue-based examination. Alsadoon (2017), in a study conducted at Saudi Electron University, found that THE provides immediate feedback and unbiased grading. Furthermore, Elgalil et al. (2022)

concur that THE offers immediate feedback, saves time, reduces malpractices, and provides accurate marking. Karim and Shukur (2016), as well as Adanir et al. (2020), agree that THE is effective compared to traditional pen-and-paper examination. THE is also reliable in grading and saves time and money on the examination process (Karim and Shukur 2016). They add that students need to be provided with efficient and convenient digital network systems to participate efficiently in THEs. According to Farzin (2016), THE simplifies traditional pen-and-paper examination in large classes, reporting, storing the results, marking, and conducting statistical analysis. The conventional examination is also tedious in invigilation, especially in large halls, which requires more effort. This literature review has assisted in revealing some prospects of the use of THE from students' perspectives.

Glitches of Using THE

Elgalil et al. (2022) maintain that students generally have positive perceptions towards using THE. However, some literature sources have identified the challenges of the use of THE. Bayazit and Aşkar (2011) show that THE increases students' stress, tiredness and focus due to their varied environment. Hiwarkar and Taywade (2019), as well as Singh et al. (2020), concur that students experience a high level of stress when participating in THE. Elgalil et al. (2022) reveal the challenges of THE, such as lack of privacy, costs, and poor infrastructure. Other drawbacks are a lack of technological skills and internet network connectivity (Adanir et al. 2020). According to Eurboonyanum et al. (2020), mathematics and science students require additional time as they initially use pen and paper to do some calculations before populating them electronically. Ilgaz and Adanir (2020) concur that THE has challenges of duration allotted to students, and also potential technical problems such as internet network connectivity. The unconducive environment is found to be another constraint. This can include issues like load shedding in South Africa. According to Iwu (2019), noisy homes, overcrowded residential accommodations, lack of facilities and time management (as students may not complete their examinations on time due to these environments) are barriers to effective participation.

Online Proctoring during THE

According to Lee and Fanguy (2022), THE's academic integrity is monitored and controlled like traditional pen-and-paper invigilation through proctoring software such as Invigilator Apps. Online proctoring is digital software that monitors movement and inappropriate actions during the examination period (Fawns and Schaepken 2022). The authors further note that online proctoring can be used to prevent academic dishonesty and to verify the student's identity to ensure that they are alone in their spaces and have no resources around them. Lee and Fanguy (2022) postulate that this software detects and reports malpractices that occur during the examination process. However, they further indicate that online proctoring applications have excessive post-examination evaluation manual work for lecturers. The literature review also established that this software restricts the number of applications used on the computer during the

examinations (Safe Exam Browser 2020), safeguarding students' suspicious or inappropriate behaviours (Coughlan, Miller, and Paterson 2021). Moreover, students feel uncomfortable being watched, which can be viewed as violating their privacy (Hubler 2020). Nigam et al. (2021) concur that there is merit in online proctoring, which reports mischievous actions and academic dishonesty during examinations.

Theoretical Perspectives

The perception theory has been adapted to underpin this study. Irwanto (2002) describes perception as an active process in which one receives stimuli of objects, qualities and relationships between the symptoms and events until the incentives are realised and understood. Broadbent (1958) describes perception as a process in which one can select, organise and interpret information and make sense of the environment to identify, retrieve and respond to that information. In other words, perception begins with the individual's observations of the situation and behaviour (Thalib 2010). This becomes the regulation or disposition and attribution process that influences the formation of those perceptions. Based on the above definitions, perception can refer to individuals' experiences and feelings towards the perceived object.

Irwanto (2002) notes that perception can be divided into two forms, whereby individuals can reveal positive and negative perceptions after interacting with the perceived object. The two forms of perception depend on how individuals describe their knowledge of the perceived object. Positive perception describes all responses and knowledge that can use the perceived object, and this will be continued by activating or accepting and supporting it. Negative perception describes all responses and knowledge that do not support the perceived object and can oppose and reject the perceived object. In this study, positive and negative forms would be understood through the students' responses with regard to THE.

Thoha (2003) identified two factors that can influence individuals' perceptions, and those are internal and external factors. Internal factors include psychiatric disorders, attitudes, motivation, attention (focus), learning process, physical state, needs and values, interests and feelings, desires or hopes. External factors are resistance, information obtained, intensity, size, motion and repetition, new and familiarity, family background knowledge, or alienation of an object. Davis (1989) indicates two external factors that influence an individual's perception: usefulness and ease of use. David (1989) further describes perceived usefulness as the perception an individual can believe in using a particular system to do the job better.

In contrast, perceived ease of use is when an individual believes using a particular system can be easy. The students' perceptions of the use of THE depend on how they perceive this type of examination, its usefulness and ease of use. They may have positive or negative perceptions depending on their experiences with this examination.

Research Methodology

This study used a constructivist worldview to understand undergraduate students' perceptions of implementing THE. This worldview was, therefore, used to analyse and interpret the perceptions of students enrolled for the Teaching Mathematics in Further Education and Training Phase (TMS3725) module in 2021, and who wrote their final examination in 2021 September/October/November, to determine how they perceived THE. Creswell and Creswell (2018) note that a constructivist worldview is a socially constructed reality through understanding the participants' voices.

This study espoused a qualitative research approach employing existential phenomenological design. According to Churchill (2021), existential phenomenological research design focuses on understanding the participants' experiences through their perspectives. The rationale of this design was to collect data in a natural setting and provide a detailed narrative that can provide an in-depth understanding of students' perceptions (those who enrolled for Teaching Mathematics in the FET Phase) of using THE.

The study was conducted with undergraduate students enrolled for Teaching Mathematics in the FET Phase in the Department of Mathematics Education at the University of South Africa. The total number of students enrolled on this module was 215, and they were approached via email to participate in this study. Semi-structured interviews were conducted with 12 students who were purposively sampled and enrolled for Teaching Mathematics in the FET Phase module and agreed to participate in the study via telephone. The students were purposively selected to understand their perceptions of THE. The interviews were audio recorded and later transcribed. In a qualitative study, the researchers can purposefully select participants and sites, allowing them to understand the research problem and question(s) (Creswell and Creswell 2018). The interviews were conducted in the first week of December 2021, immediately after the students had completed their final examinations, to avoid disturbing them while preparing to write other modules. The interviews took about 10–15 minutes between 15h00 and 16h00, which was convenient for all. Prior to the inception of the interviews, the researcher secured appointments with the students. The interview sessions took place over five days, in which three students were interviewed in one day for three consecutive days, and the other three students were interviewed in the remaining two days.

Ethical Considerations

Permission was then sought from the 12 students, and a rapport was established by explaining the purpose and rationale of the study. The study used a blanket ethical clearance for Scholarship of Teaching and Learning in the College of Education at Unisa (REF2018/03/14 90060059MC). The students were assured that pseudonyms would be used to ensure confidentiality. They were also told that their participation was voluntary and they had the right to choose to participate or not in the study. The students were

granted permission to withdraw their participation at any stage without being prejudiced. The researcher also indicated to students that data would solely be used for this study and not for any other purpose and would be encrypted to be accessed by only the researcher.

Data Analysis Procedures

This study espoused thematic data analysis to interpret students' perceptions of using THE. This type of analysis was used to identify the patterns and themes that emerged from the collected data. The researcher used the trustworthiness construct to ensure rigour and quality (Lincoln and Guba 1985). The transcriptions of the interviews were then sent to the participants for member checking. The purpose of member checking was to enable participants to ensure that the transcriptions reflected their real statements.

The transcriptions were then captured in Microsoft Excel to understand the students' perceptions of using THE. The researcher repeatedly read the raw datasets from the transcriptions to ensure familiarity and relevant information related to the research questions for this study. The re-reading of the datasets aided the researcher in classifying and reducing data into themes for the purpose of reporting. Themes that would provide evidence of students' perceptions of using THE were then developed. The derived themes were compared with the generated dataset to ensure accuracy. The rationale for using the thematic data analysis approach was to condense the varied raw text datasets into summaries. In addition, the approach helped to form connections between the research objectives and findings obtained from the raw datasets.

The researcher also ensured that both links were transparent (able to be demonstrated to others) and defensible (justifiable given the objectives of the study). The trustworthiness of the data was assessed by comparing the findings with previous research and getting feedback from students who participated in this study. Undergraduate students were allocated pseudonyms using codes, for example, SR1, SR2, SR3, up to SR 12, i.e., SR1 represented student number 1 who participated in the semi-structured interviews.

Findings

According to Shraim (2019), THE is gaining popularity in HEI, including ODL and seems to supplement or replace a traditional pen-and-pencil examination. Adanir et al. (2020) and Elgalil et al. (2022) concur that THE has gained a firm foothold in the HEI sector. The study that informed this paper aimed to explore and understand undergraduate students' perceptions of THE in the ODL environment. In addition, the study intended to understand how the use of THE was interpreted, whether the reactions were positive or negative, and to observe the students' perceptions, which can either be supportive of THE or reject THE. After assessing transcriptions, the researcher found that using THE has positive and negative perceptions. The data analysis produced themes categorised as: students' queries from emails; prospects of using THE; unconducive environment; and potential technical problems.

Prospects of the Take-home Examination

The findings of this study show that students have identified several advantages of THE: writing examinations online and offline; online submission of scripts that can be marked immediately; providing immediate feedback; eliminating the loss of scripts transported by couriers; and alleviating queries related to late submissions. Students also highlighted that THE is free of effort and can enhance examination performance with good internet network connectivity. Below is excerpt 1 of students' perceptions on using THE (quoted verbatim), and the students' names are pseudonyms coded as SR1, SR2, and so forth.

Excerpt 1

SR5	Online examination saves time as some of us come far from the examination venue and sometimes would be late because of transport. It also saves money for transport, le gona re kgona go ngwala exam ya rena online le offline [again we can write our exams online and offline].
SR6	This type of examination is good as compared to the venue-based one. It accommodates students from different locations. We are no longer travelling to examination venues and won't be late for exams anymore due to traffic.
SR10	The new online examination gives us a chance to prepare ourselves for the exam than always rushing to the exam hall. In venue-based, we used to rush for transport to the exam hall, stuck in traffic and will ultimately arrive at the venue tired and stressed.

The interviewed students indicated that THE is better than traditional venue-based examinations as they do not have to travel to the examination centres. They (students) indicated that they would not be late for their examinations due to traffic jams from their respective places. This also appears to enable them to start their examinations in a good state of mind.

Unconducive Environment

The findings of this study also revealed negative perceptions of undergraduate students with regard to THE in ODL. A number of factors identified are infrastructure, noise pollution, and the time allotted for examination. Excerpt 2 below presents the students' negative perceptions of THE:

Excerpt 2

SR4	In my place [referring to her home], we have a tavern in the neighbourhood that plays loud music and this affects the smooth running of our examination. Also, children are making noise as they play in the surroundings and this affects my concentration, e mpha stress at some stage [it is stressful]. I also do not have enough time to solve a maths problem.
SR7	This type of examination is good, but e na le mathata a yona [has its challenges]. I come from a rural area where our infrastructures are not that good and I don't have own space to write the examination. I have young children who always run around making noise and this sometimes disturbs me, frustrates me and at some point gives me stress.
SR10	In the online examination, it is difficult to work in a noisy place, children are playing around and making noise and some people are playing loud music in the neighbourhood. The time given to us is too short because writing maths is different when you write theory exam papers. In maths, we manually do calculations on paper before we put them on the laptop. Re kopa ba re okeletše nako [we ask for more time], this will reduce some pressure on us.

The students said that their THE is compromised by the unconducive environment in their respective homes. Noise pollution is one of the contributing factors mentioned, making the environment not conducive, which affects the smooth running of the examination. In addition, time allocated to THE was found to be insufficient for the examination. This time factor deprives them of manually solving mathematical problems and scanning them on the laptops or computers they are using.

Potential Technical Challenges

The students revealed the technical challenges experienced during THE, which include limited access to the internet, network connectivity, load shedding, use of an Invigilator App, and lack of proper electronic devices, which affect the process of examination. These challenges affect the usefulness and ease of use of THE and the security of the examination [as the use of the Invigilator App appears to be disturbing]. These challenges are also reported in Ilgaz and Adanir's (2020) study, which found that students experience potential technical problems such as limited access to internet network connectivity. Excerpt 3 below presents the students' responses about the technical challenges experienced during THE.

Excerpt 3

SR3	My laptop is of poor quality and some of the buttons are dysfunctional and there is also poor internet network connectivity in our area. Our internet is always on and off and on the other hand, we have a load shedding which contributes to our frustrations.
SR9	My challenge is the website when downloading the question paper and submitting the answer sheet, it gives the message, submission unsuccessful which frustrates me. This problem can be caused by a poor internet connection. The Invigilator App is also a problem during the examination.
SR11	Re na le bothata ba network in our area [poor internet network connectivity], sometimes it goes off while busy with exams, either when you download the question paper or submit the answer sheet. Poor network connectivity affects the use of the Invigilator App, it frustrates us and causes stress, and my laptop is not in good condition. … I think it would be good if we could get gadgets that are in good condition.
SR12	Load shedding and poor internet network connection are challenges that we face during exams. This problem also affects the use of the Invigilator App that monitor exams. The poor internet network connection affects us when we download question papers and submit answer scripts. This is frustrating and causes anxiety.

The students highlighted the potential technical challenges faced during THE that could be caused by poor network connectivity and load shedding, which have caused frustrations and stress to them. In addition, these technical challenges affect their time to download the question papers and upload the answer scripts.

Discussion of Findings

Generally, students acknowledged the use of THE as positive, useful and easy to use. This concurs with the study by Eurboonyanum et al. (2020), which found THE as a method that is effective and can benefit both students and the learning process. The findings are in agreement with Ilgaz and Adanir (2020) that THE is more efficient, usable and reliable than traditional venue-based examination. The findings show that THE can save money and time. Furthermore, students indicated that THE provided opportunities to write the examination at the location of their choice.

Students appeared receptive and showed satisfaction with THE. They argued that it (THE) was better than the traditional venue-based examination. Adanir et al. (2020), as well as Shraim et al. (2019), are in agreement with the findings that the online

examination is more effective than the traditional venue-based one. In addition, students highlighted that the use of THE was cost effective as the transport fees to the examination venue were eliminated. Students revealed that with THE, the turnaround time for marking scripts was good as they received immediate feedback. These findings are supported by the studies of Alsadoon (2017) and Elgalil et al. (2022), namely that the use of THE provides immediate feedback and accurate online marking.

The findings show that students seem to share similar perceptions about the technical problems that affect the smooth running of THE. These findings show that students experience load shedding and poor internet network connectivity. Adanir et al. (2020), as well as Ilgaz and Adanir (2020), are in support of these findings that the use of THE has potential technical problems, such as limited internet network connectivity. These technical problems affect the usefulness and ease of use for students and cause frustration and anxiety.

Furthermore, load shedding and poor internet network connectivity are challenges when students are supposed to download question papers or submit their answer sheets. Sometimes, the system locks students out due to high volumes. Iwu (2019) concurs that the challenges faced by students make them not finish their examinations on time, and this may cause a high level of stress, as also reported by Singh et al. (2020). The findings also show that some students' gadgets are not up to par, which is another drawback.

The findings revealed that these technical problems could compromise the examination security. The limited internet network connectivity appeared to interrupt the use of the Invigilator App to monitor examinations. Where students cannot verify their identities, academic integrity may also be compromised. The study by Fawns and Schaepken (2022) supports that students need to use the Invigilator App as a form of examination security to verify their identities and prevent academic dishonesty. This shows that academic integrity may be compromised during the examination as some students may have a chance to cheat during load shedding as the App would be disabled. Furthermore, other applications may be used to cheat when the Invigilator App is interrupted, as reported in the study by Safe Exam Browser (2020). Also, these findings are supported by Lee and Fanguy (2022), who contend that malpractices cannot be reported or detected on this application that is used to interrupt the examination process.

Conclusion

This study explored the undergraduates' perceptions of the usefulness and ease of use of THE at Unisa's Department of Mathematics Education. Perception theory was espoused to explore the students' perception of THE in relation to its usefulness and ease of use. This theory enabled the researcher to understand the ease of use and security of the implemented THE through students' perceptions. Students perceived THE to be useful, easy to use and secure as opposed to traditional venue-based examination. The findings demonstrated both positive and negative perceptions. This study suggested that for successful implementation of THE, students need to get a location free from load

shedding prior to the inception of the examination. Students need to attend mock trials arranged for them prior to the examination so that they get an understanding of how to use the website and Invigilator App for THE to be valid, reliable, flexible and secure. Furthermore, it is suggested that THE be embedded and sustained in the universities going forward. The findings can also enable lectures to understand the practicality and security of THE.

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