Perceptions of blended teaching and training methods in trades education in South Africa

by

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A research proposal submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

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ABSTRACT

The evolution of technology has transformed the education space, allowing online learning together with mainstream pedagogy. The purpose of blended learning is to combine online learning platforms with existing traditional face-to-face teaching methods. The aim of this study is to understand the perceptions of blended teaching and training methods in trades education in South Africa. The Covid-19 pandemic forced the education sector to investigate other learning methodologies that can be integrated into the delivery of education. Preceding the pandemic, accredited Skills Development Providers in trades education were not ready for blended teaching and training.

The conceptual framework guides the entire study and confirms findings from the literature and from participants, to the effect that blended teaching can be achieved when research objectives are addressed by the Skills Development Providers. The framework also illustrations relationships between various objectives. Qualitative design was utilized to understand the perceptions of Skills Development Providers regarding teaching and training methods, Data was collected by interviewing ten participants who are subject matter experts and directly involved in the delivery of trades education.

Interpretation of key findings was undertaken via thematic analysis, generated codes classifications and the tracing of patterns. Findings demonstrated various issues that affect the full implementation of blended teaching. These started with the proper understanding of the blended learning approach, barriers that influence the adoption of blended learning, and the availability of technologies for deployment in blended learning.

This study proves that blended learning can be used in trades education, which relies on the accessibility of technological infrastructure and online learning platforms that integrate trades curricula. In this process, facilitators and learners interact either in a physical workshop or by using an online platform to achieve the exit level outcomes required for a trade. Extended reality is seen as a solution to the implementation of blended learning in trades education.

KEY WORDS

Augmented reality, Blended learning, Digital transformation, Qualitative study, Skills Development Providers (SDPs), Occupational Qualification, Trades, Virtual reality.

DECLARATION

I, Morokomobe Semond Monareng, declare that this research report is my own work except where indicated in the references and acknowledgements. It 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. It has not been submitted before for any degree or examination in this or any other university.

Name: Morokomobe Monareng Signature:

Signed at Emalahleni

On the 15 day of May 2023

DEDICATION

I dedicate my research report to my late father Mr. Edwin M. Monareng, who has been a pillar of strength to me from day one and beyond the grave. His memories and encouragement will remain with me forever. Also to my mother and my siblings for being my greatest supporters, not forgetting my nephew Sphesihle Buthelezi. This journey was not going to be possible without Ms. Modiehi Seliane who took care of myself and my son: thank you.

To my son Khumo Monareng, thanks for understanding that I had to spend most of my day with my laptop. I was not ignoring you, but I was opening gates to the new world of wonder for your future self.

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Thank you, God. Ke leboga Modimo!

I would like to acknowledge the support, guidance and the valuable contribution received from my supervisor, Prof. Rene Pellissier, during this study.

To my cohort members Ms. Palesa Lephoto and Mariam Manamela: you are some of the amazing ladies I have had the pleasure to meet in this journey. You make me push my limits, which in turn helped me to concentrate on my study while I was in the darkest moment in my life. Thanks, ladies, for being the lifeline I needed.

To my mentor, for sharing valuable information: I have learned a lot from you over the years.

Lastly, to my sponsor, merSETA, for the financial support. This study would have been impossible without my employer. Let's continue "to increase access to high quality and relevant skills development and training opportunities" for the merSETA sector.

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AI	Artificial Intelligence
AR	Augmented reality
BMI	Business Model Innovation
DT	Digital Transformation
HEI	Higher Education Institutions
merSETA	Manufacturing, Engineering and Related Services Sector Education and Training Authority
QCTO	Quality Council for Trades and Occupations
SDP	Skills Development Provider
XR	Extended reality
VR	Virtual reality

Chapter 1: Introduction

1.1 Statement of purpose

This qualitative study aims to investigate the perceptions of technology use in blended learning as an alternative teaching and training methodology, specifically to deliver trades training in South Africa.

1.2 Background of the study

Trades teaching and training face changing environments caused by developments in the training needs of learners. These are prompted by changes in teaching and training technologies, as well as the competitive dynamics of remaining relevant and meeting stakeholder needs. The use of technology in teaching and developing skills is evolving, so blended learning and development have become critical to productivity in trade teaching and training.

The digital transformation is central to the Fourth Industrial Revolution (4IR), which brought changes to how things are done in the business world, plus learning and development basics (Vey, Fandel-Meyer, Zipp & Schneider, 2017). The development of digital technologies includes robotics software, machine learning, sensors, analytical tools and the Internet of things (IoT), which will work with intelligent machines (g 2021). Furthermore, Extended Reality (XR) refers to a spectrum of technologies, with completely immersive virtual environments and real situations, so that virtual reality (VR) and augmented reality (AR) come under the umbrella of XR with the interaction of technology (Pomerantz, 2019).

The Covid-19 pandemic necessitated exploring perceptions of Skills Development Providers (SDPs) with regard to adopting blended learning. According to Hrastinki (2019), blended learning is a system that combines face-to-face instruction with computer mediated instruction. Blended learning is defined as learning that is based on the dimensions of face-to-face and digital instruction (Cronje, 2020).

The range of technologies from learning platforms to the latest VR and AR technologies will be considered for this study (Zwoliński et al., 2022). Although AR technology has the potential to be a significant training tool in higher education, it is crucial to take into account how the technology will be combined with facilitator experience (Zwoliński et al., 2022).

The study will concentrate on virtual simulation as a form of online learning (being part of the blended learning) for the new generation of skilled workers, with computer-centric innovation such as computer devices and simulators being progressively utilized. Virtual simulation is about creating a real situation in a digital environment (Soori & Arezoo, 2020), These innovations are computer-based applications which imitate the behaviour of genuine objects, conditions, processes, systems and interfaces in difference conditons. The evolution of teaching and training can be delivered through the use of devices and simulators built on technologies such as VR (Lavrentieva, Arkhypoy, Kuchma & Uchitel, 2020).

1.3 Research problem

The education sector deploys learning technologies to improve the delivery of teaching and training with a view to addressing potentials and also challenges from external factors (Liu, Geertshuis, & Grainger, 2020). Delivering occupational qualifications is being done in an integrated manner in the form of work projects, facilitation and assessment linked to industry workplace application.

The SDPs that deliver the components of occupation qualifications were unprepared for the changing situation caused by the pandemic. In contrast, South African schools and universities managed to come up with remote teaching systems almost immediately. The SDPs were unready as their authority, the Quality Council for Trades and Occupations (QCTO), had not sufficiently explored the adoption of new delivery methods such as the use of digital platforms, digital innovation and embracing hybrid digital solutions.

The process will need to be initiated by QCTO, which can provide guides to SDPs for implementing innovative ways of teaching and training. The pandemic heavily affected face-to-face teaching and training with this being discontinued, resulting in a total

closure during the hard lockdown. The SDPs have not yet found other modes of teaching and training delivery. The national educational system includes vocational education as a crucial component, with this offering needed talent to assist the country to grow and improve the economic outlook. It also could help South Africa to reach the national development goal of decent employment, while the demand for qualified artisans in a variety of industries is increasing and the significance of vocational education is becoming ever more clear as economic transformation accelerates (Liang, Wang & Li, 2023).

With the new reality of social distancing and effectively virtual existence, proceedings have experienced a massive impact. The SDPs faced similar challenges given these issues, with the pandemic driving all schools, colleges and universities to stop using face-to-face teaching in physical classrooms and causing the entire educational system to be digitised. This closure had a huge impact on these institutions, and it affected teaching and training methodology (Das, Pal, Paul, Debnath, & Reza, 2021). Moreover, there was a slow adaptation of training technologies to align with the digital transformation; with this component often following the business world in exploring the possibilities of new technologies (Demartini, Benussi, Gatteschi & Renga, 2020). The lack of a contingency plan to adopt new ways of training learners posed a serious challenge in the occupational qualification teaching and training space. It was not an easy adaptation, owing to the nature of occupation qualification teaching and training, and specifically, simulations as a critical component. Nor was it easy to deliver teaching and training via a remote learning platform when physical workshops are commonly used as classrooms for learners. Hence, occupational teaching and training were suspended, with no temporary measures to mitigate the unprecedented challenges brought by the pandemic. Despite the significant shifts that occurred globally, SDPs still do not have alternatives to replace the current mode of teaching and training, that is, the traditional face-to-face method.

1.4 Research objectives

The objectives of the study are as follows:

1. To identify enablers for the adoption of blended learning in occupational qualification in trades.
2. To recognise barriers to blended learning in occupational qualification in trades.
3. To identify available technologies that support blended learning approaches in occupational qualifications associated with trades training.

1.5 Rationale

The primary aim of this study is to address the interruption caused by the global pandemic and develop an understanding of the perceptions of SDPs regarding the adoption of blended learning and, subsequently, consider the extent to which digital technology in blended learning will transform how training components within occupational qualifications are currently delivered. From this, the object is to come up with a coordinated approach. Furthermore, the study will also consider other factors that can have a direct impact on the blended learning mode in occupational qualification delivery.

1.6 Delimitations of the study

The study is conducted in South Africa, focusing on accredited SDPs within the nine provinces. Training systems from other countries are excluded from this study.

The study will only concentrate on occupational qualifications associated with trades; non-trade-based qualifications are excluded. Furthermore, the study will focus more on teaching and training relating to practical skills.

1.7 Definition of terms

B**lended learning** combines face-to-face teaching and online learning. This type of learning has developed quickly and is commonly used in education (Vallée, Blacher, Cariou & Sorbets, 2020).

The capacity to interactively explore a virtual representation derived from the real environment is known as **augmented virtuality (AV)** (Rebbani, Azougagh, Bahatti & Bouattane, 2021).

Virtual reality is generally defined as a virtual object in a virtual environment, or more specifically, a simulation or artificial regeneration of a real-life situation, created by computer and intended to engage the user by giving him the impression of directly experiencing the simulated reality, primarily through stimulation of his vision and hearing (Rebbani et al., 2021).

Extended reality is the collective term for all physical and digital settings where human and machine connection is facilitated by interactions produced by hardware and software (Doolani et al., 2020).

1.8 Assumptions

The effects of the current global pandemic will continue. At the same time, occupational teaching and training must be delivered to learners. SDPs need to remain resilient and face any unexpected uncertainty that can occur at any given period. The prospects cannot be clearly defined, however, the global pandemic has taught many structures to be prepared and ready to adjust quickly to new ways of functioning. In addition to the effect of the global pandemic, there is clear evidence that the world as a whole is becoming ever more used to Volatility, Uncertainty, Complexity and Ambiguity (VUCA). One way to look at global uncertainties is through VUCA, which describes the unstable conditions that can be chaotic, turbulent and can rapidly change the business environment. VUCA can be used in other fields to gain a better understanding about the world (Murugan, Rajavel, Aggarwal, & Singh, 2020).

1.9 Chapter Outlines

Chapter 1: Introduction

The purpose of this chapter is to provide background and insight into the whole research paper. It presents the abstract, statement of purpose, rationale of the study and introduces the problem statement. Research objectives are formulated to directly answer the research problem and overall, this chapter explains the importance of the study.

Chapter 2: Review of Literature

The chapter will provide definitions of blended learning, plus technologies to be deployed for SDPs to effectively implement blended learning. The last part will summarise blended learning and the available technologies.

Chapter 3: Research Methodology

This chapter is more about outlining the research design and methodology to be used for this study. It includes the scope of the research, population sampling techniques, data collection techniques and how the collected data will be analysed. There is also a section that addresses the issue of possible limitations and quality assurance, while the last part covers ethical considerations for this research report.

Chapter 2: Literature Review and Theoretical Framework

2.1 Introduction

In this chapter, the relevant literature will be discussed and various theories considered that are relevant to blended learning, which is inclusive of the traditional face-to-face methodology. Also covered will be online learning supported by various technologies that can deliver successful teaching in occupational training for trades with a view to digital transformation by Skills Development Providers (SDPs). The first part defines blended learning by looking at available literature and technology capabilities that can be deployed to implement blended learning within SDPs' space. It further explores the three objectives of this research as illustrated in Chapter 1: enablers and barriers to effective adoption of blended learning, available technologies and lastly the required mechanisms.

Transitioning from traditional face-to-face teaching and training to blended learning can be an entirely different experience for teaching and training, requiring all parties to adapt to new ways with few or even no other options available (Pokhrel & Chhetri, 2021).

Alternatives to traditional teaching in the physical classroom space became unexpectedly necessary with the Covid-19 pandemic. The use of numerous modalities of interaction with the same content by teachers and learners is made possible by technology, enabling blended learning strategies to be easily customized for learners with different preferred teaching and training styles (Stahl, 2021).

2.2 Definition of topic or background discussion

The aim of this section is to bring an understanding to the concept of blended learning in the domain of technology.

2.3 Understanding of blended learning

Technology will undoubtedly continue to play a significant part in how education is delivered, and the current shift to blended learning which has become the “new normal” for many higher education institutions is only likely to pick up speed in the years to come (Buhl-Wiggers, Kjærgaard & Munk, 2023). Traditional face-to-face learning frequently envisions teaching taking place in a classroom, with learners being given content and study materials by a facilitator. This enables communication between facilitators and learners as well as between the learners themselves. When facilitators and learners are not physically present in the same place, the term “virtual learning” is vague and is sometimes referred to as “online learning”, “e-learning”, “digital learning” or “distance learning” (Belur, Glasspoole-Bird, Bentall & Laufs, 2023). The focus of this study is more about the blended learning approach.

When coming up with blended learning alternatives, one should look more at the theoretical foundations of teaching and learning than at the delivery instruments if there is not going to be a noticeable difference in learner performance. One could thus contend that a definition of blended learning need not be particularly explicit in describing the precise delivery method. Instead of the meaning, it is the context that matters. Teaching should be emphasized in a definition of blended learning (Cronje, 2020).

The pandemic caused a huge interruption to the educational space. As a result of the lockdown and social isolation measures put in place by authorities in response to the Covid-19 epidemic, schools, training facilities and colleges around the world have been forced to close. For institutions that were able to move fast, online learning platforms were crucial for promoting and ensuring that teaching and training contuinued for teachers and learners (Reshi, 2023).

2.3.1 Factors influencing blended learning.

2.3.1.1 Leadership and strategic planning.

Face-to-face teaching provides benefits that the education sector cannot ignore. Despite this, senior management must encourage blended learning to the fullest extent possible in order to maximize resources offered to employees by institutions and also

support educational technology. This is also necessary to help staff members keep up with advances in the educational system (Islam & Akter, 2023).

Senior management need to be strong champions of blended learning. This will be particularly helpful with the adoption of, and support for, Skills Development Provider (SDP) strategic buy-in from all parties (Hill & Smith, 2023).

2.3.1.2 The technology in blended learning.

Blended learning is more about promoting an innovative environment in the classroom, with the use of technology possibly being the most appropriate method to bring about an innovative situation together with new digital devices (Casanova & Moreira, 2018).

The deployment of technology can also be seen as a digital transformation strategy, as SDPs need to consider new ways of enhancing the technology in line with the business rules to support the SDPs' structures (Casanova & Moreira, 2018).

Advances in technologies, together with digital applications and teaching resources, are important factors that transform the education space and this will contribute to the change in teaching (Neborsky, Boguslavsky, Ladyzhets & Naumova, 2020).

2.3.1.3 Delivery methods linked to blended learning.

A link exists between the use of technology, blended teaching and learning methodologies (Bhadri & Patil, 2022).

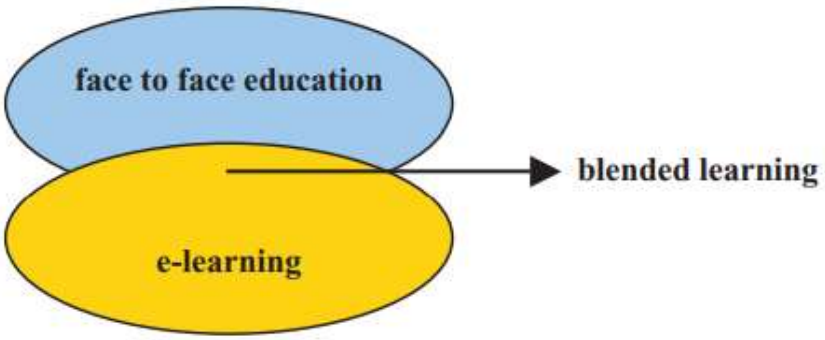

Figure 2.3-1: Blended learning concept (Köse, 2010:2796).

2.3.1.3.1 Face-to-face methodology.

Face-to-face methodology in blended learning extends traditional classroom instruction by allowing learners more time to connect with their teachers. As a result, the setting allows all parties to gain more understanding about various personality issues in the classroom while system communication is aided by face-to-face interaction. Facilitators and learners can both receive immediate feedback, which benefits the teaching-learning process. Face-to-face connection is highly stimulating for both facilitators and learners, giving the process a more natural feel (Pachisia, 2022).

2.3.1.3.2 Online learning methodology.

Learners can learn anything from anywhere, at any time, and from anybody, in a virtual classroom. Learners are able to participate in a virtual classroom meeting with their classmates and facilitator in a cyberspace location, regardless of geographical location. Skills Development Providers (SDPs) can also organise so that the system can adjust, and learners who are unable to attend classes on a regular basis can benefit from this. In addition, learners can connect with other professionals and broaden their expertise. With the world becoming a global village, learners who use this mode will be on a level with their peers in any other area of the world and will gain inherent experience as well (Pachisia, 2022).

From the literature consulted it can be seen that the terms “online teaching”, “digital learning”, “web-based learning”, and “e-learning” are normally used interchangeably within the education space.

Additionally, organized online learning gives learners the chance to take advantage of all the benefits of digital technologies, including flexibility and customized distribution of study time, while noting that digital learning is intended to suit all unexpected situations (Gadzaova, Goverdovskaya, Alisultanova & Moiseenko, 2021).

Proposition 1

There are factors that promote the use of blended learning.

2.4 Barriers to Blended Learning

With not all learners coming from financially comfortable homes, blended learning presents the disadvantage that they may not have access to facilities that assist with online teaching and training. Consequently, some institutions of learning will face serious challenges in terms of budget constraints, sourcing of required technologies and lack of skills by facilitators, meaning that thorough planning is required before implementing blended learning in order to minimize potential challenges, with advances in technology being one factor affecting how education is conducted (OsmiZein & Iskarni, 2023).

2.4.1 Budget Constraints.

According to Dangwal (2017), inability to budget effectively for learning and development becomes a challenge as it does not promote the improvement of teaching and training. Facilitation, equipment and the cost of hiring qualified facilitators all make training an expensive undertaking. Additionally, training budgets tend to be small, while training demands are always steep. What further contributes to challenges in training and development is when a strained budget also needs to incorporate new technologies and software costs.

Skills Development Providers (SDPs) need to ensure that as part of the budget planning process, all departments submit their training and development plans to learning and development (L&D) who can then — as part of their strategy and budget planning — incorporate all departmental L&D budget requirements to ensure the training budget is sufficient to cater for all employees (Gil, 2019).

2.4.2 Systems and technologies.

The subject of how teaching and training methods might be improved utilizing information and communication technologies (ICTs) in various classrooms has been brought to the front by the acceleration of technological globalization over the past three decades. An in-depth understanding of the advantages of blended learning in learning practices is provided by earlier research, which highlights advantages such as enhancing pedagogy richness and learner achievement, boosting self-directed

learning, giving teachers and learners more flexibility, improving education accessibility for learners, presenting opportunities for professional learning, and meeting the unique needs of each learner (Ashraf, Tsegay & Meijia, 2021).

Digitalization can be defined as the process of translating different information into a digital language. The converted information can be in audio, video, text or any other format. The advent of the Internet has affected almost every activity of an individual. The Internet plays an inevitable role in everyone's daily life with just a single click (Seethal & Manaka, 2019).

The advent of the Internet and advanced technology revolutionized the education sector. Educational institutions across the world have begun to introduce the latest methods for sharing knowledge with learners, such as smart boards (Seethal & Manaka, 2019).

2.4.3 Lack of access to technologies.

Providing teaching and training solutions is still a challenge to organisations, and SDPs would like teaching and training to be automated in view of the pandemic (Covid-19) which forces social distancing and distance learning. The teaching of management systems for effective training and development is lacking (Rasheed, Kamsin & Abdullah, 2020).

Rasheed et al. (2020) mentioned that organisations have only limited platforms for learning and development, with mobile platforms not being used to improve teaching, or training and development access. The challenge is that learners are unable to access training anywhere and at any time using their mobile devices. This means employees will have to sit at their computers to be able to undergo training. Organisations perceive mobile platforms as presenting a threat to the organisation’s data.

Roslan and Halim (2021) indicates that some learners lack access to a study area or study room at home, while some lack access to the required technology in the form of Internet connectivity and devices for blended learning. This can be as simple a matter

as Wi-Fi access. Lastly, the issue of mobile broadband coverage presents a serious challenge.

Further to that, Roslan and Halim (2021) identified Internet connectivity and devices required for online learning that can be easily used for blended learning:

- Devices such as desktop, laptop, smart phone and tablet; and
- Internet connectivity such as Internet connection at home, home Wi-Fi, Mobile Broadband and public Wi-Fi.

2.4.4 Reskilling and upskilling of teachers and facilitators.

Facilitators and tutors are encouraged to advance their knowledge and embrace new teaching techniques. It would be advantageous to assist facilitators in developing a more learner-focused, mentoring-style approach if a decision has been taken to transition to blended learning and advocate aiding facilitators in developing their abilities for online teaching (Belur et al., 2023). Facilitators must be knowledgeable about, and skilled in, the use of efficient instruments and procedures for distance learning. Facilitators should also actively monitor developments within the technological space and look for methods to incorporate these into an educational approach that is more about technology literacy (Bursa, 2023).

2.4.5 Resistance to change.

Facilitators often lack time to prepare for online lessons, while having only limited skills and limited access to technology, meaning that insufficient online expertise and inadequate training can cause them not to be keen on these transitions. As facilitators are required to switch from traditional teaching methods to online platforms suddenly and without proper preparations, extra work is required. This is frustrating for the majority of teachers and can lead to resistance (Jubran, Al Fayez & Abueita, 2023).

2.4.6 Lack of customisation and alignment of learning materials.

The main challenge when implementing a new method is creating a faultless and open teaching resource system, covering all linkages in the teaching process through the

new system, and enabling learners to use contemporary information technology to acquire curriculum content and complete practical activities as per the prescribed curriculum (Han & Ge, 2023).

Trades teaching and training focuses on using generic training, which is a one-size-fits-all approach. This is not relevant either to learners or the new technologies within the industry. A generic training approach can strain learners' time and patience by forcing them to engage with methodology that simply isn't relevant to them. This leads to serious issues of adaptation, which also make it irrelevant and causes fruitless expenditure on the technical training environment.

Proposition 2

The barriers to blended learning have a negative impact on influencing SDPs to fully implement a blended learning approach.

2.5 Technologies for blended learning

The current global trend is for the education sector to adopt automated technology-based virtual education and learning tools that will be accessible to all learners. At the same time these learning tools will have an element of flexibility and be compatible in order to advance the blended learning approach. The implementation of blended learning requires systematic planning, design and curriculum development to achieve effective learning goals (Agrawal & Sharma, 2022).

This form of education also gives pupils more involvement by encouraging them to experiment with technology. Teachers and learners of all ages now have access to some form of technological equipment, such as a computer, smartphone, tablet, etc. Pupils can use these tools and remain interested in what they are doing. Teachers should be aware that they contribute to the digital learning environment by selecting and engaging with themes, posing questions that require mentors assistance, arousing curiosity, and fostering creativity (Rajaratnam & Shivananda, 2022).

According to Lia and Cheong (2022) extended reality (XR) combines augmented reality (AR) and VR, and has advanced significantly in the field of education, both theoretically and practically.

2.5.1 Virtual reality (VR).

Virtual reality technology makes it possible to deliver real-world learning through virtual space while providing an actual, effective and adequate occupational learning experience, as virtual spaces are utilised to prepare learners to perform real-world tasks and procedures. It is imperative to compare real-world learning with VR-based training (Xie et al., 2021).

Simulation learning is a compulsory component of occupational learning, utilizing the professional model to allow learners to perform actions effectively and productively. VR technology has a number of advantages: it allows improved learning processes, accelerate the transfer of knowledge and experience and the simulation is closer to the actual operation, which should be guided by specific teaching and production tasks (Lavrentieva et al., 2020). The figure below illustrates the various types of VR experiences.

Figure 2.5-1: Types of VR experiences and accompanying platforms (Lai & Cheong, 2022:13 695).

Virtual learning is not going away. It is not just for emergency situations but also for everyday life. Remote learning is a very effective instrument for higher education with several benefits in terms of coverage and reach. A precedent for its use has been established in the wake of the Covid-10 crisis that the world experienced, and further study is required to realise its full potential. More research is required to understand

pedagogical competencies, learner competencies, learner-to-learner and facilitator-learner interaction, plus curriculum content that supports high-quality learning in the virtual space (Villarroel & González, 2023).

2.5.2 Augmented reality (AR).

A real-time technology that considers physical, real-world issues and that has been enhanced by the addition of virtual, computer-based information is referred to as augmented reality (AR). The placement of virtual information in the user's immediate environment through AR improves perception of, and interaction with, the actual world (Lai & Cheong, 2022).

Augmented reality experiences can be delivered by Fixed AR, Mixed AR and mobile (Lai & Cheong, 2022), with these authors further mentioning that AR platforms can be additionally delivered through Mounted spatial view and Smart device display.

Figure 2.5-2: Types of AR experiences and accompanying platforms (Lai & Cheong, 2022:13 696).

The basic idea behind the technology known as Augmented Reality virtual data is to simulate the real world before implementing computer-generated virtual information (Chen et al., 2019).

2.5.3 Other learning approaches.

Some studies indicated that not all learners have the capacity to carry out their duties and acquire information via online platforms. In this instance, not every learner in the class is able to take part in the activities and subject discussions that are held in the

classroom setting. There are lots of good things about blended learning, but there are also some limitations (Bursa, 2023). Online learning environments in some educational contexts do not provide learners with enough, or reliable, resources and the required skills (Ali, Khan & Alouraini, 2023).

There are some aspects of practical training, such as the use of force, that would necessitate a significant amount of face-to-face instruction for learners. Also it will be necessary to practice realistic scenarios for facilitators to be able to communicate with learners in real time, make mistakes and try again – which maybe simpler in a face-to-face setting (Belur et al., 2023).

Cronje (2020) further maintained that the definition of blended learning should utilize a variety of theories, approaches and technology in a way that best supports learning in a particular setting.

In one definition of blended learning, the mix of modes of web-based technologies was mentioned (Cronje, 2020), these being:

- Live virtual classroom;
- Self-paced instruction;
- Collaborative learning;
- Streaming video; and
- Audio and text.

Proposition 3

Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.

2.6 Analytical Framework

2.6.1 Theoretical framework.

This section introduces a theory that was driven by the research and it will support the study (Lederman & Lederman, 2015). The theoretical framework is presented in the

form of a structure that is linked to a research study. It will provide knowledge and understanding for one to formulate a conceptual framework while the structure explores the relationship between various features.

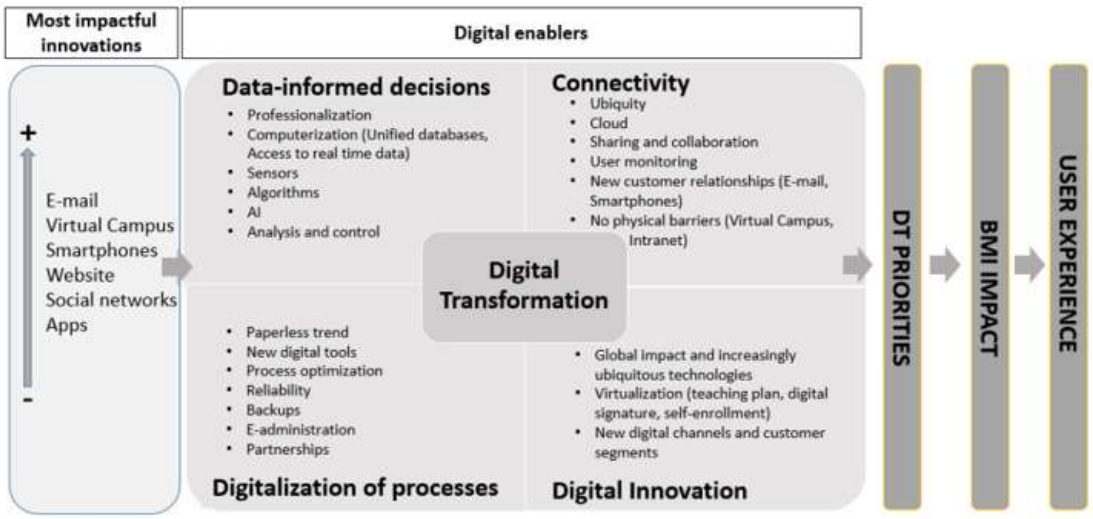

Figure 2.6-1: Higher Education Institutions (HEIs) digital transformation concept (Rof, Bikfalvi, & Marquès**,** 2020:7).

The figure above illustrates that digital transformation is not only about introducing something new such as digital tools and devices, but is also about adaptation and automation of all processes while allowing effectiveness and eliminating all physical processes and barriers: this shows that all connectivity and digital transformation processes can improve operations (Rof et al., 2020).

The starting point will be usage of the most impactful innovations, which include devices that have revolutionised individuals' daily lives such as smartphones and websites. Digital enablers support digital transformation in any business as the enablers justify adoption of technologies to improve efficiency, value of the business and innovation. In addition, the outcome of adopting the required technologies will illustrate digital transformation priorities for the business unit and promote business maturity based on the effectiveness derived from the used enablers. Lastly the entire framework will elevate user experience by providing a seamless learning experience.

Data-informed decision: the shift that occurred in the education space required the adoption of online teaching, careful examination of decisions, with facilitators making

decisions that affected teaching and learning based on available data whether learners were in a classroom or online (Usher, Hershkovitz & Forkosh-Baruch, 2021).

Digitization of processes: digitization refers to a new phase that is trending which includes prioritizing the education system, which is replacing contemporary trends and information. Digitization in education aims to ensure individualization through the use of big data, virtual and augmented reality, cloud computing for mobile devices, and other advanced learning technologies (Qizi, 2021).

Connectivity: with blended learning, learners may seldom or never visit the physical institutions, so communication is crucial in online learning. Most online learners communicate with institutions primarily through online platforms. The key to engaging, connecting and keeping students in online education will be human communication, an online human touch, and administrative assistance, even while technological and telecommunications developments are revolutionizing communication and educational delivery (Betts, 2009).

Digital innovation: To innovate, one must think beyond what is being done now and come up with a fresh concept that allows the continuation of work in a different way using digital tools and new technologies (Serdyukov, 2017).

2.6.2 Conceptual framework.

This section deals with why the study should be conducted. It brings known knowledge, influenced by available theories, and this will identify gaps in the current framework of teaching and training and outline the overall picture that indicates relationships among the presented ideas and how they relate to the study (Varpio, Paradis, Uijtdehaage & Young, 2020).

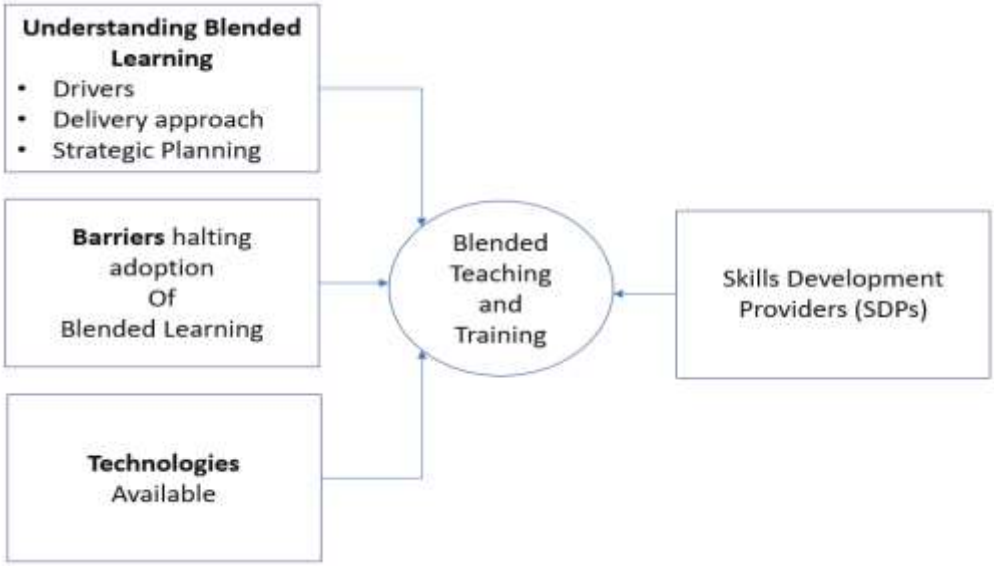

Figure 2.6-2: Conceptual framework of blended teaching and training.

As blended learning develops, SDPs should be in a position to deal with the three important elements that will ensure the success of blended teaching and training.

Understanding of blended learning within the context of the SDPs includes the issue of strategic initiatives driven from the leadership and supported by all parties. A full understanding of blended learning needs to embedded into the delivery instruction via the combined methods of teaching and training. Strategic planning will talk to the maturity of digital transformation in SDPs.

There are significant barriers to blended learning for SDPs including budget constraints, lack of skills and technological issues.

Technologies are available for consideration when adopting blended learning and learning platforms that transform the teaching and training space.

2.7 Conclusion of Literature Review

2.7.1 Proposition 1

There are factors that promote the use of blended learning.

2.7.2 Proposition 2

The barriers to blended learning have a negative impact on influencing SDPs to fully implement a blended learning approach.

2.7.3 Proposition 3

Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.

Chapter 3: Research Methodology

3.1 Research approach

Subjective assessment of attitudes, views and behaviours are essential to the qualitative research approach (Singh, 2022). This study was based on a qualitative research report, which explored and understood the perceptions of Skills Development Providers (SDPs) regarding blended learning for the occupational qualifications associated with trades. The qualitative study aimed at achieving a deep understanding about SDPs adopting blended learning.

With this research study, more was uncovered about the perceptions of senior management and facilitators with regard to adopting blended learning, and the support that can be contributed by them to the entire approach.

3.2 Research design

The qualitative study was based on the phenomenological approach, (Ataro, 2020) described the goal of phenomenological study as a means to understand the essence of social occurrences through the eyes of individuals who experienced them. With this approach, the research study achieved an in-depth understanding from engagement with the decision-makers and facilitators who are delivering the learning process. This design obtained rich data and collected information about future learning plans from senior management and facilitators, covering their perceptions and attitudes regarding the adoption and implementation of blended learning.

The selected approach assisted in gaining a better understanding of a learning framework that supported blended learning, used information provided by senior management responsible for the SPD.

The focus of this study was on a particular population group, the intention was to obtain intense experiences by investigating the actually perceptions of technologies used in blended learning. The opportunity supported the researcher to ask questions related to teaching and training and Microsoft Teams was utilized to record all participants' interview sessions.

3.3 Data collection methods

The actual data was sourced through pre-scheduled interviews with senior management of accredited SDPs in South Africa. The reason the chosen method was to collect in-depth data directly from decision-makers' experience and knowledge, plus their perceptions of the blended approach. The interviews provided detailed information about participants' experiences and perspectives on the adoption of blended learning.

3.4 Population and sample

3.4.1 Population.

The identified population consisted of personnel associated with accredited SDPs within private, public and TVET colleges with SDP accreditation status. The population had senior management, who included different stakeholders.

3.4.2 Sample.

Ten participants associated with accredited SDPs were interviewed. They had contributed useful information, as they are administering the delivery of learning. Emails were forwarded to all accredited SDPs to participate in the study. The interviews concluded and the data saturation was reached.

3.4.2.1 Sampling method.

The study involved interviewing five senior management team members and five facilitators from accredited SDPs. Two sampling methods were considered.

Snowball sampling was used to interview participants from different SDPs who are stakeholders within the network of the Skills Development fraternity. Non-probability sampling was used to select units from a population using a subjective judgement (Bae, Park & Jeon, 2022).

3.5 Research instrument

Research data was collected through scheduled online interviews. A formal letter outlining the purpose of the research was forwarded to senior management of the identified SDPs requesting the voluntary participation of senior managers and facilitators. Interviews had focus on participants' who understood blended learning, barriers to blended learning adoption, available technologies to assist with blended learning, as well as the mechanisms required to effectively implement blended learning.

3.6 Procedure for data collection

In terms of the Protection of Personal Information Act No 4 of 2013 (POPI Act), a formal request was forwarded to merSETA Corporate Services Executive for permission to extract the contact details of all identified SDPs from the merSETA database. Following that, invitations were sent via email to SDPs with a covering letter outlining the purpose of the research report and providing details of interview dates and timing.

3.7 Data analysis strategies and interpretation

The qualitative data collected was analysed using a thematic analysis approach to trace patterns when contrasting the various experiences of participants. The data analysis process commenced immediately.

3.8 Quality Assurance

3.8.1 Transferability.

Data in this research study was to be added to the existing body of knowledge for future reference. In qualitative research, the expression “transferability” refers to how the research findings from one researcher can be applied to another piece of research (Laumann, 2020).

3.8.2 Credibility.

According to Laumann (2020) credibility is a process that involves methods to assess the accuracy of data and ensure findings that meet the quality standards for qualitative research. For this study, credibility will be achieved as participants will be individuals with direct experience and understanding of the research topic as they are delivering learning daily.

3.8.3 Dependability.

In this study dependability indicates that the research results are consistent and can be replicated by other researcher (Kyngas, Kaariainen & Elo, 2020). The methodology used for the study will ensure that collected data is properly documented and results are scrutinised, with another researcher being able to reuse the documented data.

3.9 Ethical considerations

With ethical considerations in mind the study ensured that the aspects listed below were adhered to:

1. Participants were properly briefed on the purpose of the study and provided with the option to participate voluntarily. A consent form was issued.
2. Participants remained anonymous.
3. Consent was sourced from participants to audio record the interviews.
4. No form of incentives or favourable treatment was offered to participants.

5. Ethical clearance was obtained from the Wits Ethics Committee prior to the commencement of data collection.
6. A plagiarism declaration form was signed and formed part of the research report submission pack.

3.10 Proposed schedule and timelines

The table below depicted the scheduled timeline for the study.

Table 3.11-1: Proposed Timetables

Planned Activity	**Proposed Date**
Supervisor allocation	03 March 2022
Introductory meeting	28 March 2022
Submission of Chapter 1, 1st draft	14 April 2022
Submission of Chapter 1, 2nd draft	07 May 2022
Submission of Research Proposal draft	19 June 2022
Final Research Proposal submission	30 June 2022
Defending the research topic (Panel presentation)	5 – 7 July 2022
Panel outcome feedback	26 July 2022
Ethics outcome	19 January 2023
Data collection	28 February 2023
Data analysis	09 March 2023

Planned Activity	Proposed Date
Research Report 1st draft submission	28 March 2023
Research Report final submission	01 May 2023

Table 3.11-2: Consistency Table: research questions, propositions, data collection and data analysis

RQ #	State Research Objective	Prop/hyp #	State Proposition or Hypothesis	Data collection detail	Data analysis method
1	To identify enablers for the adoption of blended learning for occupational qualification in trades.	1	There are factors that promote the use of blended learning.	Interview guide questions: 1, 4, 6.1, 9 & 8	Narrative content analysis (themes)
2	To recognise barriers to blended learning for occupational qualification in trades.	2	The barriers to blended learning have a serious influence on the ability of SDPs to fully implement a blended learning approach.	Interview guide questions: 2, 5 & 6	Narrative content analysis (themes)

RQ #	State Research Objective	Prop/hyp #	State Proposition or Hypothesis	Data collection detail	Data analysis method
3	To identify available technologies that support blended learning approaches in occupational qualifications associated with trades training.	3	Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.	Interview guide questions: 3, 7 & 10	Narrative content analysis (themes)

3.11 Conclusion

The blended learning method will help SDPs to achieve their main objective of delivering teaching and training through the adoption of technology. This study will focus on enablers of blended learning, identify the barriers to digital transformation in delivering teaching and training, and verify available technologies.

Various theories were consulted concerning the identified objectives of the study and propositions were formulated in line with the theories linked to blended learning and available technologies.

A detailed narrative of the research process chosen to carry out this study has been provided here, depicting a logical path for how data will be collected, sampled and then analysed.

Chapter 4: Presentation of Results and Findings

4.1 Introduction

This chapter examines the data collected for this research study, covering perceptions about deploying learning technologies to improve the teaching and training. A discussion of these findings follows. Data was sourced through pre-scheduled interviews with representatives of accredited Skills Development Providers (SDPs). The data analysis starts immediately after the first interview using a thematic analysis approach in a qualitative study.

The chapter is in three sections. The first section details participants' demographics. The second section presents findings from selected participants, the purpose having been to comprehend individuals' understanding about the implementation of blended learning, identify existing barriers in the SDP environment, and to discuss available technologies. The third section identifies themes from the findings.

4.2 Interview Procedure

Formal invitations to participate in a research project were sent to 18 individuals. Following acceptance, agreement details and consent forms were forwarded to participants. Subsequently an MS Teams videoconferencing invitation was sent to participants as per the agreed date and time. Permission to record was requested prior to the interview and participants were made aware that it was entirely voluntary. Transcripts after the interviews highlighted the main issues that came up during the session. Ten participants were interviewed and no new themes emerged, resulting in saturation being reached.

4.3 Demographics

4.3.1 Participants' industries.

Table 4.3-1: Participants' industries

Participants' Industry and related representation	
Skills Development Providers	7
TVET Colleges	3

Participants who were interviewed came from two different institutions of learning accredited as SDPs by the Quality Council for Trades and and Occupations (QCTO).

Participant Expertise

Artisan development management involves three areas: technical knowledge, and operational and administrative skills, to enable accredited SDPs to function. This study focused on experts with diverse disciplinary experiences in the field of artisan training. There is a rationale that more learning is achieved in the workplace, and participants have industry experience within the engineering and mining sectors. Eight participants are qualified artisans, with experience in management, training and development.

4.3.2 Categories of trade occupations for participants.

The participants interviewed represent the trade categories highlighted in the figure below. A total 4 out of 10 participants are in mechanical trades and the remaining six form part of electrical trades.

Figure 4.3-1: Occupational trades.

4.3.3 Participants' locations.

Participants from seven South African provinces were involved in the study.

Figure 4.3-2: Participant locations.

4.4 Code Classification

The table below lists participants according to their positions and the code classifications used herein. The majority of participants were training managers and qualified artisans.

Table 4.4-1: Code classification

One-on-one interview participants	Code classification
Interview Participant 1, Project Manager Engineering	PMEI01
Interview Participant 2, Training Manager	TMI01
Interview Participant 3, Skills Centre Manager	SCMI01
Interview Participant 4, Training Manager	TMI02
Interview Participant 5, Training Manager	TMI03
Interview Participant 6, Skills Development Provider Director	DI01
Interview Participant 7, Learning and Development Specialist	LDSI01
Interview Participant 8, Accreditation Manager	AMI01
Interview Participant 9, Superintendent Learning and Development	SLDI01
Interview Participant 10, Training Manager	TMI04

4.5 Data Analysis Process

The process of analysing data derived from the interviews first required familiarisation by the researcher. Coded classifications were generated for all participants, themes were searched for, and then the themes were reviewed. This was required to add structure, order and meaning to the collected data. Thematic analysis was used to analyse and interpret data in this study, this method being able to trace patterns when contrasting the perceptions of the ten participants who brought their knowledge and experience to the study.

4.6 Results Pertaining to Proposition 1

Proposition 1: There are factors that promote the use of blended learning.

Proposition 1 was addressed though a series of questions, with this section being concerned with seeking to understand blended learning, and validate how SDPs solicit buy-in from senior management. The reason for this was to understand the support offered by senior management when implementing new systems for learning and their role in identifying new training initiatives. Participants where also asked if they believed blended learning should be adopted.

4.6.1 Understanding of blended learning.

The findings below confirm that participants understand blended learning to be a combination of two or more different learning methods.

> *Blended learning, according to my own understanding, it's a combination where there is face-to-face learning and online training.* (TMI01)

> *Blended learning, it's learning that will consist of different methods, not limited to a textbook, just sit in front of a facilitator, but it's a learning that learners can also use electronic gadget to facilitate learning, use different forms of communicating, not only a human-assisted learning but it's technology and human.* (TMI03)

Blended is more about combining different methods of learning, bringing learning in the physical workshop and presenting some knowledge components online. (DI01)

My understanding of blended learning is where you use two or more methods of teaching. Let's say, for example, the physical one, face-to-face with the learners, or you use simulators in different areas, or you use online platforms, an interactive, uh, platform. (PMEI01)

Blended learning refers to learning where a learner is given an opportunity to be exposed to virtual training, on-site training, and then work towards workplace training. It is a virtual learning plus face-to-face. (SCMI01)

Participants described how blended learning can be seen as an innovative way of teaching.

Blended learning is not limited to only theory, so it's theory, practical, assignments, group assignments. So, it's a learning environment that is inclusive of everything that's around or available to be used for learning. (TMI02)

My understanding is that a blended learning is where one tries to take the actual understanding and get to link online system. It's about bringing the two together. (TMI04)

Blended learning is the old way for learning plus combine new methods of learning including issues of technology. (LDSI01)

Blended learning is a mixture of traditional approach as well. It is a transition from the traditional approach to the technological approach; this approach was tried during the pandemic. (AMI01)

4.6.2 Factors influencing blended learning.

4.6.2.1 Face-to-face teaching.

Participants strongly believed that a practical component needs to remain in the traditional face-to-face approach. Blending of teaching can take place with the knowledge component.

> *Remember the practical component will be bit of a challenge to do it electronically, with theory it can be done, and practical will be difficult to do it now. Budget constraints will not be an issue. Remember with moving to more digital environment, it will save time.* (TMI01)

> *Theory components can be delivered online. Technical components will definitely require physical space to perform certain tasks. Face-to-face element is still needed.* (DI01)

> *Theory can be done online but in terms of practicals that is still a problem as British company the challenge can be on customizing the learning approach to online platforms. Foresee budget constraints. In training there is philosophy called 70/20/10 model, 70 percent of their knowledge from job-related experience, 20 percent recall from interactions with others and 10 percent is learned from theory. The course can be presented online, the learners still need to be in a workshop to be shown how to operate certain machine. Some things cannot be done on virtual space.* (LDSI01)

> *With practical component through simulation workshop, a learner will be needed on the floor to touch and to feel the equipment that they need to perform a certain task. Touch and feel, learners need to assemble things using their hands, ability to see…* (SLDI01)

> *In virtual space, learners will never know their strength, especially when tightening the terminal in the conductor, as he does not physically work with it and does not have the feeling of any stripping of a wire as to how strong to squeeze and not to break the copper. Physical workshop will add value to the*

training. Employers will not trust learners that qualified in a virtual space. (TMI04)

4.6.2.2 Online learning.

The SDPs had started exploring an easily accessible online platform so as to be able to continue their work. Meanwhile the situation was forcing them to transition and provide learners with an opportunity to learn.

The college already started with coded welding, the new occupation qualification, it was part of mandate to training learners on the blended approach, so the college is already moving into that space. (PMEI01)

The SDP used a system called a clicker system, a multi-choice format done online. (TMI01)

Google Classroom, virtual training room and using livestream videos. (SCMI01)

Remote learning are arranged for learners to cover the theory components, it will [be] a classroom setting equipped with cameras: learners are able to interact with the facilitators. Virtual training room. (DI01)

The college has already moved ahead with adopting new technologies such as VR as they is a robotic skills centre. (AMI01)

4.6.3 Factors influencing adoption of blended learning.

4.6.3.1 Leadership alignment.

Participants had indicated that senior management needs to drive the adoption of blended learning. This also applied to any other initiatives in the learning framework: without them setting the tone, actual implementation will not occur. Even if the learning framework is governed by the QCTO there has to be a clear alignment with the SDP strategy.

Learning framework falls with senior management, they have the biggest role in terms of driving any policy that the institution might want to implement. (TM103)

Senior management set the tone, especially in a regulative point of view and on standards. Policies need to be derived from senior managers, they approve the policies and ensure the implementation of the policies including [that] the quality assurance of the training at the strategic level is not compromised. (PMEI01)

An additional response from Participant 4 emphasized the key role of senior management in delivering trades learning.

Senior management is quite involved in the formulation of the learning framework, even though their work is based on the minimum requirements given by Education and Training Authorities. They are able to augment in order to align with the training required in industry. (TM102)

Participants 7 and 10 agreed with the above narrative:

Senior management need to set up a platform whereby training can happen easy and effectively without any frustration. System should be in place. (LSDI01)

The senior management role is to ensure that the training delivered ultimately marries and met up with the curriculum. (TMI04)

Other participants indicated that senior management was already performing the task of taking a lead in ensuring that staff members are trained, driving efficiency and assisting in getting problems solved.

Senior management came up with other initiatives to keep the Skills Development Provider running. (DI01)

Senior management has already started with empowering staff members at the TVET College. They have already launched robotics centre and there are series of training arranged to capacitate staff members. There is proper

support from senior management as they are the drivers. Without them there will be no implementation. (AMI01)

4.6.3.2 Underperformance or poor performance.

Most participants did not function during the pandemic crisis. As a result, teaching and training were on standstill. Participants provided reasons for not delivering learning during the Covid-19 pandemic. They indicated that the practical component could not be delivered using online platform or devices.

Training stopped, recalled all learners who were on sites busy with on-job training in the workplaces, so there was no learning. Only induction occurred as it was a legislative training. It also occurred with limited numbers of people in the classroom. (LDSI01)

Training was suspended, a plan to deliver some training online was done, using platforms such as Zoom to deliver the introductory training. For practical learning the learners needed to come to the physical workshop. (DI01)

The college was operating in a panic mode, took some time to adjust to the new reality, status quo was the order of the day. Whereby everyone was like: "It's impossible, nothing can be done." (PMEI01)

Occupational qualification training consists of three components: knowledge, practical skills and work experience. A final external summation, known as a trade test, must be passed for a learner to be deemed a qualified artisan.

Honestly, not much happened during the pandemic in terms of training. The SDP did not function for about eight months, there was no system in place to allow the training of practical training. (TM102)

To be honest we were shocked, not all prepared. Having theory and practical training, the technical component did not move to digital platforms. Currently learners are back to classes. The SDP was trying to move the theory component to the digital space, but the practical component cannot move to

digital space as it is going to be difficult. Realized that in reality it was not going to work. (TMI01)

When it came to practical component the SDP could not assist learners with their training. It was very impractical to be able to provide practical training to learner. (SLDI01)

4.7 Results pertaining to Proposition 2

Proposition 2: The barriers to blended learning have a negative impact on influencing Skills Development Providers (SDPs) to fully implement a blended learning approach.

This section sought to understand the barriers to blended learning within the learning space. Also examined were the adoption of blended learning, factors affecting blended learning and the interventions required to implement a blended learning approach.

4.7.1 Barriers to blended learning approach.

4.7.1.1 Budget constraints.

The findings relating to budget issues are not surprising, as no one had anticipated the financial impact of the pandemic and the changes that came with this crisis.

Budget for infrastructure, more advocacy around technology and also an issue of increasing training of staff members. (PMEI01)

The availability of budget can help to turn thing around in terms of adopting new technologies into the learning space. (AMI01)

For SDP to turn things around it's only a matter of budgeting. It can be envisaged and work on practical methods. (SLDI01)

The major challenge with blended learning is the funding from the learner's side to be able to afford the data to be on the platform. (SCMI01)

The learning material would still need to be fully developed in terms of ensuring that learning is delivered online. It will also affect the issues of budget to fully

cover all required resources in terms of infrastructure. Funding for equipping infrastructure. (AMI01)

The hindrance to the SDP moving into blended learning is the availability of online platform providers in South Africa. Providers need to make product for trades. As European available product will require the college to subscribe and that talks to the SDP budget, register each learner, and have a licence for the facilitator. Also come with a budget of training all facilitators. And the cost of data in the country is so expensive, some TVET colleges do not have Internet connectivity. (TMI03)

4.7.1.2 Adopted technologies.

Findings from the participants indicate that SDPs had already started with some initiatives working in the direction of blended learning by introducing new methods of teaching and training.

The college had already started with e-learning in one of their campuses have been trying to do remote teaching and learning on other disciplines. (PMEI01)

Induction programmes are done online. Also allowing staff members within training to work remotely from home. Blended learning is more about using more than one method of learning. (LDSI01)

Available software at this stage is the Google Classroom which is a good tool because you can upload videos, livestream videos, but it is an expensive system. The SDP has not found another learning platform. Funding will be challenge as the learners are government-funded. Learners' issues of sourcing available software will be difficult, if they add on Google Classrooms it can be used but they normally charge per learner or per user. (SCMI01)

On the other hand, some SDPs failed to implement any form of online teaching and training intervention.

Not yet. (TMI01)

Would not say yes, the SDP is using much of traditional type of learning, so it's the face-to-face kind of learning and training occurs in a practical method in the workshop. There is no blended learning, still using traditional learning. (TMI02)

When dealing with technical components/tasks it is very important for learners to be in physical space. (DI01)

With new interventions there are issues of resistance from staff members. Upskilling and reskilling is required for them.

4.7.1.3 Resistance to blended learning.

Participants highlighted the issue of facilitators resisting the new methods of teaching and training. This could be caused by issues of comfort, competence, redundancy and additional responsibilities.

Definitely there will be a big challenge, there will be a lot of resistance. Remember, they're moving from comfort zone into a digital space. (TMI01)

…one of the things that the staff members are scared of is to teach online, that technology will take their job, but if you look at its depth it can even create more jobs. Still there is that fear that it's going to make facilitators redundant. (PMEI01)

Resistance from facilitators will always be there, especially when people are expected to perform more responsibilities, unless the employer can offer certain benefits to the facilitators. (LDSI01)

4.7.1.4 Lack of skills.

Participants highlighted the lack of adequate skills. They would need additional skills and knowledge to be able to teach learners via the envisaged technologies and platforms for teaching and training.

Lack of ICT skills can be huge challenge, every facilitator needs to have a bit of ICT skills. The SDP need to upskill and reskill facilitators. (TMI03)

Facilitators need to have basic computer skills, the SDP need to make sure that facilitator computer skills is not limited. Obviously it will be easy for young facilitators as with them technology will not be challenge. (DI01)

The challenge for facilitators is that they do not have ICT soft skills, the college has done a skills audit to identify all facilitators that need to be reskilled in terms of technology. The college submit a WSP for identifying training. (AMI01)

In terms of technical trades, the facilitators should be able to work with computers, Google sites to get resources. Currently the ideal thing will be to top-up the skills, through upskilling and reskilling set up one- or two-day training sessions just for the facilitators to understand the software and how to utilise the actual simulation component of the training programme. (TMI04)

4.8 Results pertaining to Proposition 3

Proposition 3: Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.

Participants presented approaches that proved useful, especially in delivering the knowledge component. The challenge picked up from the experts was that learners needed to use their hands and show competency in the real workshop.

4.8.1 Vehicle to enhance the learning processes.

4.8.1.1 Virtual classroom.

Participants mentioned the issue of a virtual teaching space where online teaching and training occurs, and where facilitators and learners interact using technological tools.

Some trades like welding, the virtual learning can assist the learner on knowing how to hold and move your hands around the welding rod without really welding a piece of steel in virtual space. Wastage can be reduced but at the

end of the day, the learner still needs to practice welding in the physical workshop. (TMI03)

Introduction of blended learning can be done depending on the discipline of learning. Not all modules can be covered using technology. Example in electrical trade wiring of a domestic house requires the facilitator to directly demonstrate the task to the learners – it cannot be done on the virtual space. Some practical training can done via technology using virtual classroom, but definitely some cannot be done. (LDSI01)

In some modules can be done via online platforms and learners will still need to be in physical workshop. Some demonstrations will be done remotely. (AMI01)

With the availability [of] technology such as virtual reality, training can be blended when bringing in technology to that space, however learners need to come to the workshop for some components. There are certain components that require a real workshop. Learners need to touch and feel some components, this helps them when arriving at the workplace for on-job component. Blending should be supported by more or new technologies. (SLDI01)

4.8.1.2 Mixed approaches of teaching.

The majority of participants emphasised that technological methods can be mixed with the traditional approaches of teaching and training. Teaching and training for occupational trades are distinctive and differ from other learning disciplines.

Extended reality can be positive for trade, the training is dynamic some things need to done in an actual workshop with real tools, real car engines. The virtually space will have programmed simulation, yet learners need to use their hands to touch and see, affirm the performance of a task in a real environment as learners are required to explain how things are operated. Blended learning can reduce time learner spend in the SDP as some learning are learned through online platform, but practice must put in a real space. (TMI01)

Have a serious problem with these whole virtual things because it is dangerous. We can have clever technology, however the learners will not experience all their human senses. For example, in Diesel Mechanics, the learner will not smell the motor oil, the learner is not getting closer to the reality for the trade. Should be remembered that for each trade the learners need to be physically strong because they can need to lift up an engine. Virtual training can never replace the real simulation that happens in the physical workshop – it can be an addition to it. (SCMI01)

Cannot run away from the reality, the virtual space will not have a real application. It should be remembered that after the theory and practical components, learners should be entering the workplace knowing and being able to identify the components within the trade. Even the workshop in the SDP is not covering the entire simulation component that is never enough without the on-job component. (DI01)

Blended learning can be able to achieve some part of training. It cannot replace the workshop training, no ways that blended learning will ever be able to replace the reality of the real-life experience. Computer can never teach to have emotions. Been electric shocked many times in my life and I know what it feels like to be shocked. No computer is going to be able to show that to a learner. A learner cannot feel that feeling of the real electric shock when coming to electrical trade. So blended learning can be a stepping stone to learning process, but not replace the physical workshop. (TMI04)

Regardless of the challenges, the experts indicated that the knowledge component can be delivered online without any limitations.

…when it comes to theoretical component it will be easier because of online communication. (SLDI01)

Another effort made by the college was implementing online registration, they are busy equipping the college staff members so blended learning can be in full form, even the sourcing online learning materials. (AMI01)

The centre had extensively discussion around these areas, Google classrooms will be utilized, and the workshops could be set up with cameras where presentations can be done, it will be like a virtual practical where learners can at least observe, and delivery of theory will not be a challenge. (SMI01)

During the interviews it emerged that some SDPs had explored new methods of teaching and training, which also had certain limitations.

Targeted interventions or approaches are starting to develop in slow pace. If we get into another pandemic tomorrow the SDP will not be ready, especially with trades, trade rely more on practical components, so it needs a lot of development around the practical component because it's not just making uploading a textbook on a learning platform. The learning needs to be compatible with learners' pace of understanding. The video and listen[ing] to online lessons are not enough, learners need to use their hands in the workshop and demonstrate the practical competency. (TMI03)

No really, thinking of virtual reality type of an intervention, previous SDP had a 3D cube which had programmed training basically for learners to do practical training. So learners would be able to go into normal learning environments and build circuit, one could create interactive exercises within the cube using right equipment, unfortunately could not see the end results. Such interventions can bridge the gap between practical training which can be done remotely. (TMI02)

I was privileged to work with a US-based company that set up a learning programme during the pandemic where they started conducting courses online using VR headset simulation and wanted to bring it to South Africa. The problem was it was designed for American systems, so it was indicated to them not to bring it in country because the American wiring is done completely different. My job was to rewrite the American model to the South African model practical on the electrical training to see if blended learning could achieve its objective within a context of trades. (TMI04)

Yes, partially some modules can be moved into virtual space, one of the things that is happening even with the trades if you continue using the old methods of training, learners lose interest, once technology is added learners show some interest. It is the way to go. (PMEI01)

It can be part solution, learners still need to come back to the physical workshop and do their practical work through show and tell, that is, face-to-face, demonstrate the stripping of the engine and put it back together. Facilitators will need the learner in front of them. (SCMI01)

In the engineering industry there are people who get their limbs cut off, finger cut off. The issue of zero tolerance in terms of no injuries, no fatalities, that [is] quite important and in virtual space this cannot be covered. Also including the issue of housekeeping that learners learn from the actual workshop. (DI01)

Partial blended learning can be incorporated into trade training. (AMI01)

With blended learning it will be a screen talking to a learner, as humans were made to engage with people, unfortunately the 4IR is trying to say machines are the future and not a person. At the end of the day machine need to be created, somebody has to create it, to tell the computer what to do, and that needs a human being. We must never forget that. (TMI04)

Some positive aspects were perceived by participants:

A curriculum developed should align with the site (industry) requirements, when learners enter the market, they should be able to fit with the exception of market. The SDPs should produce learners that are ready for the employer. Quality Council or government need to ensure that curriculum has to be reviewed on an ongoing basis: for example if a new car is introduced in market, learners are supposed to be trained in those components and the issue of safety is quite important. (PMEI01)

Confident that it can be solution if only South Africans put their mind together and get the relevant authorities to think around this. Not to depend on influx of technology coming from outside the country as it not compatible to the

country's system, hence remarking that South African solution to South African problems. Find South African solutions to it. (TMI03)

In trade training, blended learning can be incorporated into system to be able to deliver knowledge component. (LDSI01)

One participant pointed to the issue of class size and distance:

The issue of also compressing the distance by using online platforms to bring technology into skills development. (SLDI01)

4.9 Key themes

The themes for one-on-one interviews are indicated below. These will show how the study was categorised.

Table 4.9-1: Key themes from one-on-one interviews

Proposition	One-on-one interview themes
Proposition 1.1: There are factors that promote the use of blended learning.	Understanding of blended learning
	Leadership alignment
	Poor performance
	Face-to-face training
	Online learning
Proposition 1.2: The barriers to blended learning have a negative impact on the influence to the Skills Development Providers (SDPs) to	Budget constraints
	Technology

Proposition	One-on-one interview themes
fully implement a blending learning approach	Lack of skills
	Resistance to change
	Regulatory aspects
	Industry participation
Proposition 1.3: Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.	Virtual classroom
	Mixed approach to learning

4.10 Summary of results/findings

This chapter outlined the findings of the study according to the responses and themes found in the collected data. Key findings are that there are barriers to fully implementing blended learning within the occupational qualifications associated with trades. South Africans are not yet ready to fully blend teaching and training for occupational trades. Also, solutions relevant to South African problems need to be developed by experts who understand the components of trades training.

Chapter 5: Discussion of Results and Findings

5.1 Introduction

This chapter presents the interpretation of research findings derived from responses provided by participants. The discussions herein will be based on themes found within these responses. Findings will be connected with the relevant literature to support the study.

5.2 Discussion pertaining to Proposition 1

Proposition 1: There are factors that promote the use of blended learning.

How can the adoption of blended learning be encouraged?

5.2.1 Understanding of blended learning.

The literature that was consulted portrays blended learning as a combination of teaching and training methodologies (Belur et al., 2023). In addition, the literature argues that a definition of blended learning does not necessarily need to specify the actual delivery mechanism. It should place strong emphasis on teaching and training, and when considering blended learning options one should look more at the theoretical underpinning of the teaching rather than the delivery methods (Cronje, 2020).

Most participants agreed with the literature and confirmed that blended learning is a combination of different methods of teaching and training. Furthermore, participants understood that blended learning does not only refer to teaching and training based on technological platforms. Instead it should be understood as being more than one method of teaching which should commence with traditional teaching and training, to which are added technological platforms and any other methods that can include technology (Cronje, 2020).

> *Blended learning, it's learning that will consists of different methods not limited to a textbook, just sit in front of a facilitator, but it's a learning that learners can also use electronic gadget to facilitate learning, use different forms of*

communicating, not only a human-assisted learning but it's technology and human. (TMI03)

Throughout this study the focus has been on the form of education called blended learning, also referred to as digital learning, this being a combination of traditional classroom techniques with online learning opportunities and educational resources (Kumar, Mehrotra & Gangwar, 2023). With all the technological developments available, online and offline learning environments are successfully combined through blended learning (Kumar et al., 2023) .

5.2.2 Factors influencing blended learning.

5.2.2.1 Face-to-face methodology.

The literature that was consulted established that within blended learning, a face-to-face delivery method is central to full comprehension of the concept of blended learning in the education space: this gives learners more time to interact with their facilitator, promote communication, and promotes instant feedback which is advantageous for the teaching and training process (Pachisia, 2022).

Participants agreed with the above and strongly emphasized the need for face-to-face teaching and training when it came to the practical skills in trades training. This method of delivery is about physical interaction between facilitator and learner in a physical space. It enables learners to touch and use tools, cut objects using their hands and dismantle engines in a real workshop.

Theory components can be delivered online. Technical components will definitely require physical space to perform certain tasks. Face-to-face element is still needed. (DI01)

Despite all the advances in technology, it is crucial to recognise that the traditional face-to-face method of delivery has intrinsic potential for both teaching and learning. It can also be mentioned that not much is known about other methods of delivery as compared to face-to-face delivery. Traditional face-to-face, where facilitators and learners share a physical space, has a long history (Ananga & Biney, 2017).

In comparison to other methods of teaching and training, the face-to-face method does not allow flexibility, but it ensure that facilitator and learner experience natural communication — this includes non-verbal indications like tone of voice, gestures, eye contact, touch and facial expression. plus allowing facilitators to pay attention to learners' inconsistencies (Yin & Shi, 2022).

Face-to-face teaching ensures there is a real-time interaction between facilitator and learner. It is an efficient way of delivering lessons to learners in a classroom environment.

5.2.2.2 Online learning.

The literature that was consulted highlighted the benefits gained from facilitators and learners interacting using online platforms and noted the flexibility of engagement occurring anywhere and at any time: while lessening learner attendance concerns, it can promote networking with other subject matter experts to expand knowledge and will take the learning to international standards (Gadzaova et al., 2021).

Five participants confirmed the benefits and shared some of the online platforms that were used for teaching and training during the Covid-19 pandemic period. For a continuation of this, Skills Development Providers (SDPs) need to be proactive and come up with solutions. Livestream videos were one example highlighted by participants and these offer a solution that can reach learners countrywide.

> *Google Classroom, virtual training room and using livestream videos.* (SCMI01)

An additional interactive system mentioned in the findings is the classroom response system – "clickers" – that allows facilitators to load multiple-choice questions, then collect and assess the responses from learners. Also, physical workshops are equipped with cameras to be used for educational purposes and this allows interaction using technological tools.

The rise of Information and Communications Technology (ICT) has affected many aspects of people's lives, including how facilitators and learners engage in learning activities in the education sector. The development of online learning, together with

technological advances, aims to increase the effectiveness and accessibility of education (Prasetyanto, Rizki & Sunitiyoso, 2022).

The availability of digital technologies has made online platforms more accessible for teaching and training, and as the world evolves it is important for institutions to keep up with new developments and be innovative. Furthermore, facilitators need to be creative in terms of sourcing suitable platforms that will align with the curriculum.

Poor performance

The literature highlighted measures that were implemented in reaction to the pandemic and that this implementation had a significant impact on the educational landscape, with online learning platforms proving essential for teaching and training to continue (Reshi, 2023).

Participants confirmed that the pandemic crisis disrupted the delivery of education, with SDPs being forced to close their doors and suspend teaching and training. New methods of teaching and training had to be introduced during the pandemic, hence blended learning gained momentum.

> *The college was operating in a panic mode, took some time to adjust to the new reality, status quo was the order of the day. Whereby everyone was like: "It's impossible, nothing can be done."* (PMEI01)

The impact of the pandemic cannot be ignored. It brought many changes in all sectors of the economy. In the education space it started as a chaotic experiment involving testing a few easily accessible tools to enable teaching and training to continue for learners.

Alexa et al. (2022) stated that during the pandemic most people were upset with all the things that occurred. Because of the lockdown, countries also closed their education systems, so that these measures had a direct impact on many aspects of life, including the education space. In addition, what was once seen as a short-term answer for a unique circumstance started to resemble a new norm for the education space in the form of blended learning.

It can be agreed that blended learning offered continuity and gave SDPs an opportunity to progress with the teaching and training process. Participants mentioned that different methods were introduced during the pandemic period for the benefit of learners.

5.2.3 Factors influencing adoption of blended learning.

5.2.3.1 Leadership and strategic planning.

Senior managers are seen as the most vital supporters, with the literature supporting the idea that in any organisation or institution of learning, leadership must demonstrate a strong sense of direction and motivate all staff members to complete work assigned to them and reach the strategic objectives leading to implementation of blended learning (Islam & Akter, 2023). For easy adoption of blended learning, senior management needs to play a major role in influencing the entire SDP staff to participate fully in the “new normal”, and obtain a strategic buy-in from all parties to adopt the new ways of doing things (Hill & Smith, 2023).

The participants’ findings affirm that senior managers should set the tone for the adoption of blended learning and the infusion of new teaching and training methods. With them leading the new process, it will be easy for staff members to follow and this will certainly promote the acquisition of resources and infrastructure required for blended learning.

Participants further agreed that new initiatives should be driven by senior management, and that it is important senior management are seen to be practising effective leadership. Seeing that blended learning approaches incorporate the use of technologies, senior managers should be investing more in learning for staff members, so that they keep themselves relevant in terms of understanding the new developments that come with running an efficient institution of teaching and training. Complacency is not an option for any growing entity.

> *Senior management came up with other initiatives to keep the Skills Development Provider running.* (DI01)

Leadership models are changing as new technologies and skills are included in education settings. Good leaders should be skilled in handling technology, and have complete control over the adoption of new technologies (Milton & Al-Busaidi, 2023).

Leadership should be seen as encouraging change, be able to envisage the future for a learning institution, manage resistance and conflicts throughout the change process, motivate staff to adapt to the changes, and drive forward the “new normal” to ensure the success of the institution.

5.3 Proposition 2: The barriers to blended learning have a negative impact on influencing Skills Development Providers (SDPs) to fully implement a blended learning approach

5.3.1 Barriers to blended learning.

5.3.1.1 Budget constraints.

The study indicated that failure to budget effectively for infrastructure to support specialised structures required for blended learning is a problem. Trade training is expensive, and while training demands are usually high, the training budget is not prioritized, so the requirement to include costs of new technologies in an already constrained budget adds to difficulties in the training space (Dangwal, 2017).

The literature supports learning and development for staff members: SDPs need to conduct a skills audit for proper planning as to the skills required by employees. This will ensure that adequately skilled facilitators are ready and prepared for the new ways of teaching and learning. Likewise the training budget should be confirmed as adequate to accommodate all staff members as part of the strategy and budget planning (Gil, 2019).

Participants confirmed the budget challenges faced, with budgets needing to be adjusted as the circumstances change in any teaching and training institution. Adequate budgeting gives the SDPs the opportunity to plan and develop workable solutions for the adoption of blended learning, as well as pave the way for new developments and purchase adequate resources for the adoption of blended learning.

One clear observation is that budget constraints are a serious factor that can block any innovative processes.

> *For SDP to turn things around it's only a matter of budgeting. It can be envisaged and work on practical methods.* (SLDI01)

Participants also supported staff training budgeting for teaching the new skills required to effectively deliver blended learning.

TVET colleges with accredited SDP status are public colleges within the Post School Education and Training (PSET) sector. Being public institutions, the major barrier to the advancement of blended learning is the allocated budget for expansion and enhancement of the education system, with the insufficient funding for colleges placing a huge obstacle in the way of implementation (Hafeez, Kazmi & Tahira, 2022).

Developing quality skills in terms of training learners can be expensive, and training budgets need to be sufficient. With blended learning, new technologies to integrate online and face-to-face teaching will clearly be required.

5.3.1.2 Systems and technologies.

The literature consulted emphasised that the influx of technological advances brought major changes to the education sector. Blended learning, involving the use of technology, was not going to be possible without information and communication technology (ICT). New ways of teaching and training using online platforms have some elements of flexibility, improve the richness of pedagogy, boost self-directed learning, improve education accessibility for learners and allow learners to be trained at the pace best suited to them (Ashraf et al., 2021).

The literature suggests that aspects such as a lack of online teaching and training platforms are considered a barrier to the implementation of blended learning. These limitations are a huge concern for education overall. Among the critical factors affecting blended learning are the inaccessibility of devices and Internet affordability problems, which contribute to learners not fully participating in the blended learning process (Rasheed et al., 2020).

Participants confirmed the lack of technologies for blended learning, and they took the initiative to search for easily accessible online platforms for teaching and training. Google Classroom was cited as an online platform to upload lessons for learners. In addition, findings indicated that e-learning platforms were used for other courses offered by the TVET college. However three participants hinted that SDPs kept to the traditional methods of teaching and training, with no systems and technologies being implemented. It was added that practical skills needed to be delivered in a physical setting, hence new technologies would not suffice.

> *Available software at this stage is the Google Classroom which is a good tool because you can upload videos, livestream videos, but it is an expensive system. The SDP has not found another learning platform. Funding will be challenge as the learners are government-funded. Learners' issues of sourcing available software will be difficult, if they add on Google Classroom it can be used, but they normally charge per learner or per user.* (SCMI01)

At the same time, these improvements that came with new technology were not adequately able to benefit the education sector in terms of affordability and opportunities presented by the online approach because they were executed without sufficient planning and design. As a result, there is a strong chance that online learning critics will continue to believe that online teaching is a weak substitute for traditional education (Alexa et al., 2022).

5.3.1.3 Resistance to blended learning.

It is clear from the literature that facilitators have limited technological knowledge and access. Their lack of online expertise and inadequate training may make them less open to accepting blended learning. For the majority of facilitators, switching abruptly from traditional teaching techniques to online platforms without proper preparation, might well result in resistance (Jubran et al., 2023).

Participants appeared to be aligned with the findings from the literature that facilitators will resist change because of their limited technological skills. Two participants further indicated uneasiness to move to the new teaching space as they lacked the knowledge and skills needed for blended learning.

Definitely there will be a big challenge, there will be a lot of resistance. Remember, they're moving from comfort zone into a digital space. (TMI01)

Skills Development Providers should allow facilitators some time to adjust to the changes. Facilitators will accept the changes if the concept of blended learning is understood and the required resources are made available to them.

Resistance can be caused by how new developments are introduced to facilitators. Facilitators need to be prepared prior to the implementation of blended learning and SDPs must provide all the required resources.

5.3.1.4 Reskilling and upskilling of teachers and facilitators.

The findings from the literature consulted suggest that facilitators need teaching and training competencies to be able to conduct teaching and training using online platforms. Use of effective online tools required knowledge and expertise, also facilitators should keep a close eye on technological advancements and find new ways to incorporate them in their teaching and training methods. Technology literacy is critical (Bursa, 2023).

Another important element illustrated in the literature is that it would be useful for SDPs to support facilitators in creating a more learner-focused and mentoring approach, while encouraging them to adopt innovative pedagogical approaches and promoting support for facilitators to create skills for online teaching and training (Belur et al., 2023).

Three participants confirmed the findings from the literature by mentioning a lack of basic ICT skills as being a key challenge for facilitators in the SDPs' space: this can be viewed as a major barrier. The SDPs need to invest in new skills for facilitators, as education is shifting from traditional methods to the use of various technologies. Findings from the participants pointed out that in trade training, facilitators need to be able to access important resources online to enhance their teaching.

Lack of ICT skills can be huge challenge, every facilitator needs to have a bit of ICT skills. The SDP need to upskill and reskill facilitators. (TMI03)

The education sector needs to continually train teachers and facilitators to adopt and respond to the current requirements of their learners and community and thereby improve education innovation. This can be affected by various factors, including the economic crisis, current developments in digital telecommunications and all technological advancements. All of this suggests a shift in the educational space, which calls for facilitators to receive ongoing training in order to be able to respond to the needs of the people effectively and help learners develop their digital skills (Aguirre, Aperribai, Cortabarría, Verche & Borges, 2022).

Limited access to technological resources can be perceived as a barrier, as technology is central to blended learning. For effective implementation of blended learning, SDPs need personnel who are knowledgeable in conducting online training and who have the skills to train learners.

it would be possible to start with basic technology skills. Online tools can be complicated for normal facilitators who are qualified artisans while lacking any technological skills: effective use of these online tools can lead to the delivery of successful blended learning programmes.

it is the facilitators' responsibility to develop and prepare for lessons while monitoring new developments in teaching and training platforms, because blended learning uses multiple types of tools to deliver teaching. Blended learning requires a strong technological knowledge, so sufficient training should be provided to facilitators.

5.4 Proposition 3: Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.

5.4.1 Vehicle to enhance learning processes.

5.4.1.1 Virtual reality (VR).

As indicated in the literature, virtual reality is the future of teaching and training: it will improve interaction and collaboration in the education space. The technological tools used in VR allow learners to understand the theoretical concepts of trades training in

the virtual space. The literature consulted agreed that VR technology makes it possible to give real-world teaching and training through a virtual space while providing an actual, effective and appropriate occupational learning experience. It is essential to contrast training using VR and real-world teaching (Xie et al., 2021).

Participants confirmed that VR can be adopted and integrated into the blended learning methodology. They further mentioned one specific trade and shared some advantages that can be realised only through using a virtual space for teaching and training, this being that SDPs will be able to save in terms of reducing wastage on welding consumables while still training learners in a physical space. (Welding rods are wasted by learners during training.) Virtual reality can be beneficial to the teaching of the knowledge component in the trades training, but with practical skills the learner-and-software scenario will not work completely and the blending of teaching and training will be required for this component.

> *Some trades like welding, the virtual learning can assist the learner on knowing how to hold and move your hands around the welding rod without really welding a piece of steel in virtual space. Wastage can be reduced but at the end of the day, the learner still needs to practice welding in the physical workshop.* (TMI03)

The findings from participants and the relevant literature indicate that VR will transform the delivery of education. Buck and Tyrrell (2022) support this, and although blended learning gives the teaching and training trajectory more flexibility, there are still times when the facilitator and learners must be physically present.

Some modules can be covered using VR technology, however learner and facilitator still need to interact in the physical space to ensure learner competency in a trade. Participants further argued that the VR space has a negative effect on sensory systems as it does not allow learners to feel that which can be experienced in the physical world: this will compromise training.

Participants were unfamiliar with augmented reality, hence they concentrated solely on VR.

5.4.1.2 Mixed approaches of teaching.

Several studies in the literature show that not all learners are able to complete their tasks and gain knowledge using an online platform: instead, learner competency can be achieved through a combination of different methods of teaching. While blended learning has many benefits, there are also some drawbacks. This view advocates that blended learning is not only about the usage of technology, but it involves blending that ranges from traditional method of teaching through online learning and any other means of teaching and training that can be introduced by facilitators to enhance the teaching space (Bursa, 2023).

With regard to the findings from the literature consulted, there are some aspects of practical skills that would require a significant amount of face-to-face instruction for learners. Additionally, learners need to practice realistic scenarios and facilitators will need to be able to communicate with learners, both of which may be easier in a face-to-face setting (Belur et al., 2023).

Participants confirmed the findings from the literature (even if sometimes using different terminology) that learners can take lessons online for theoretical skills but then attend classes in person to interact with a facilitator to improve their skills in a physical setting.

> *It can be part solution, learners still need to come back to the physical workshop and do their practical work through show-and-tell that is face-to-face, demonstrate the stripping of the engine and put it back together. Facilitators will need the learner in front of them.* (SCMI01)

Blended learning is an approach that can only be used in any discipline within the education space if all stakeholders understand the concept fully.

A certain school of thought articulates that the traditional approach promotes ways of knowing, including that facilitators and teachers are a source of knowledge, for example that teaching mathematics requires repetition and memory, and as a result, facilitators are unable to adapt to new developments in education (Manandhar, Pant & Dawadi, 2022).

5.5 Conclusion

The aim of this chapter was to understand the perceptions regarding blended learning, and the findings discussed here were drawn from personnel within accredited SDPs. The literature covered in Chapter 2 was discussed in line with the findings from participants.

A summary of findings relating to the propositions is presented below.

Proposition 1: There are factors that promote the use of blended learning.

The study validates that blended learning integrates different methods of teaching and training to enable the continuation of learning and improve the education landscape. Senior managers are seen as drivers for change, providing a sense of vision, inspiring staff members, supporting changes, and providing resources for the adoption of blended learning. Two methods of learning are discussed in the study: face-to-face and online learning.

Proposition 2: The barriers to blended learning have a negative impact on influencing Skills Development Providers (SDPs) to fully implement a blended learning approach.

The study showed that budget constraints are a barrier to blended learning and SDPs need to reprioritize their spending to align with new technologies. Lack of systems and technologies are factors that hinder the full implementation of blended learning. The study emphasized factors that most influence facilitators' resistance to giving full support for blended learning, these being benefits, limited knowledge and skills.

Proposition 3: Technology should be seen as a vehicle to enhance the learning processes as well as facilitate better digital transformation in a teaching and training space.

The literature studied, plus findings from participants, together confirm that VR is one of the technologies that can be embedded into trade training. Virtual reality has the potential to improve the delivery of training. Again, the study concurs with the notion that blended learning is a combination of different teaching and training methods: it does not exclude traditional face-to-face, and is not limited to technology.

Chapter 6: Conclusion and Recommendations

6.1 Introduction

This study sought to understand the perceptions of Skills Development Providers (SDPs) regarding the adoption of blended learning. Findings from the study suggested that all parties understood the concept of blended learning in simple terms as being a combination of various teaching and training methodologies, also that blended learning is not exclusive to any teaching approach. This study identified several barriers to the full implementation of blended learning. To overcome these barriers, support for blended learning will be needed from senior management, plus greater investment in resources and people development. Both the literature and findings from participants acknowledged that technologies are available for teaching and training in the blended learning space: this approach lets facilitators deliver lessons through various approaches blended into one system.

This chapter summarises the study, bringing together all the preceding chapters from the purpose of the research to the findings. This section will also indicate any limitations to the study, while the final section will provide recommendations and suggestions for further research.

6.2 Conclusions regarding Objective 1

Research Objective 1: To identify enablers for the adoption of blended learning in occupational qualification for trades.

The study identified the enablers of blended learning as follows:

- Understanding blended learning as a critical component when starting with the blended learning approach. With proper understanding, it will be simple to implement an approach that is known and whose benefits and weaknesses are understood. The pandemic brought a significant shift in the delivery of education to learners and led to the introduction of new teaching methodologies. The introduction of blended learning was forced by the Covid-19 pandemic crisis, at the start of which education stakeholders did not see a need to explore other

teaching options …until there was clearly no alternative. The pandemic caused huge disruption to education. However, following the pandemic the education sector is progressively returning to face-to-face teaching.

- Leadership and strategic planning are important, with participants and the literature concurring that senior managers are responsible for supporting new adoptions, envisioning the future, being drivers, motivating staff members and ensuring that staff are offered adequate training to be able to execute their daily task of delivering teaching and training. Strong support from leadership can boost staff morale and performance.

The study depicted blended learning as a combination of traditional face-to-face and online learning. These two delivery methods – face-to-face and online learning – were outlined. In relation to face-to-face learning this study concluded that it allows facilitators and learners to interact live in a classroom setting, it is the most traditional form of teaching, and is teacher-oriented. According to the literature consulted and participants' views, online learning is a method of teaching and training that is delivered through the use of Internet platforms. This study has identified that various platforms and applications are offered by diverse service providers and online learning can be tailored according to curriculum requirements.

6.3 Conclusions regarding Objective 2

Research Objective 2: To recognise barriers to blended learning in occupational qualification in trades.

Blended learning has not yet been fully adopted by SDPs owing to some barriers identified in the study. Budget constraints are highlighted as a barrier to blended learning: to overcome this challenge, adequate budgeting is needed to provide for educational infrastructure and resources. Blended learning cannot be implemented without sufficient tools and adequate finance, again, SDPs need to prioritize budget allocation for the training of staff members in appropriate skills to deliver teaching and training using online platforms or any other form of educational instrument that can enhance the process.

Lack of access to technologies: facilitators need to be in a position to access all required technologies, as this will improve teaching competence, while changing the education landscape and the style of teaching. IT support is also critical for using technological tools: this includes both devices and Internet connection. Technology has made it possible for facilitators and learners around the world to interact using different online resources.

The third barrier recognised in this study is the reskilling and upskilling of facilitators. This will benefit the process and so improve teaching and training, while facilitators will be comfortable using online platforms as they will have the required skills to transfer knowledge using these platforms. It is the responsibility of facilitators to be inquisitive and search for more platforms to improve their teaching skills. Resistance from facilitators can be minimised provided that all resources can be accessed by facilitators. This can change their behaviour, attitudes and approach to blended learning.

6.4 Conclusions regarding Objective 3

Research Objective 3: To identify available technologies that support blended learning approaches for occupational qualifications associated with trades training.

The study established that various technologies are available to support blended learning. Virtual reality (VR) technology required an in-depth investigation from all stakeholders, with the responses showing that VR has a potential to be used for blended learning in trade training, as it will allow for the curriculum to be built into the computer program, with everything being completely virtual – created by the computer.

The study concluded that mixed approach learning is recommended for teaching and training. The name suggests a mixed approach is blended learning, with both the literature and participants agreeing that blended learning is a new approach for the education space. With this approach, learning can never be disrupted, and different methods of teaching will be added to improve the delivery of knowledge to learners. The answers show strong evidence that this approach will leverage the best methodologies and provide the greatest advantages that can be obtained from any

education method. It will allow for the integration of learning components to ensure delivery of quality lessons.

6.5 Limitations

This study focused solely on accredited SDPs and excluded learners who will be beneficiaries of blended learning. Selected SDP participants had limited experience and understanding of blended learning, as this approach had been forced by the pandemic. However these selected SDP participants are directly involved in trades training.

6.6 Recommendations

6.6.1 Technology adoption mindset.

The education sector has no option but to change in line with the speedy technological advancement currently taking place, with SDPs particularly needing to be extremely responsive to today's constantly changing world. The Covid-19 pandemic made it possible for those in the education space to utilise the online platforms that were available at that stage, but going forward, SDPs need to participate in digital transformation and explore more advanced ways of improving their focus on responsiveness. The pandemic taught all sectors of the economy to be quick to react to all teaching and training demands, and to take advantage of technological advances and changing teaching methodologies. The arrival of the Internet came with new teaching and training considerations, and as technology continues to evolve it presents more opportunities for new and advanced methods of teaching and training. Responsiveness also applies to how SDPs will create teaching methods and have systems that will be seamless: irrespective of the online platforms or methods used, every component needs to be user-friendly. Responsiveness is central for digital transformation, and in terms of SDPs that means deploying changes that align instantly with the curriculum so that facilitators and learners gain more relevant knowledge and experience, thus ensuring competency. Skills Development Providers need to be in a

position to focus on innovation and be creative, giving them the ability to respond to changes in whatever unique situation arises in the future.

6.6.2 Infusing training and development needs into a strategy.

Training strategies need to allow SDPs to create procedures for the development of staff members' teaching and training skills. Once staff members are trained in new teaching methods, this helps them to deliver teaching in more effective ways, improving the quality of education and thus competency for learners. For SDPs, developing a training strategy will ensure that all efforts related to the operation of the entity benefit from the competency of the entire workforce.

A training budget is needed to cover all training requirements, expected or unexpected, including those that can emerge as a result of unplanned developments. This budget will serve as a guide to how training capital will be utilised during the year, minimizing overspending and ensuring a return on investment is realised. For SDPs to achieve their missions effectively, quality skills audits need to be conducted to ensure that staff members have proper skills: if training gaps are identified, then adequate training need to be provided for the entire workforce. Businesses that invest in training achieve global success, with the success of a learning institution depending on a competent and skilled workforce. The education landscape demands that staff members keep pace with technological advancement and best practices.

6.6.3 Lifelong learning.

Skills Development Providers need to encourage lifelong learning so that their staff members can continually advance their educational knowledge and experience. This process can be formal or informal and needs to take place throughout an individual's life, with the acquisition of new knowledge being a never-ending process. With the advent of technology and with blended learning, acquiring new knowledge is essential. It needs to be put into practice using online platforms and appropriate technologies, with the development of new skills necessitating a deliberate effort from individual staff members. Lifelong learning will allow staff to remain assets to the education sector for

years to come and this approach will guide an SDP through all the changes it may experience.

6.6.4 Inclusiveness of blended learning in curriculum.

Blended learning can be integrated into the normal traditional teaching methodology, ensuring that facilitators deliver lessons according to the curriculum requirements. The inclusion of blended learning will similarly inspire SDPs to provide all required technological infrastructure and resources for full implementation. More investigation is needed inro the inclusion of, and support for, a mixed teaching and training methodology.

6.6.5 Regulatory enforcement.

Government regulations and policies are necessary in order to protect the interests of citizens. For institutions to accomplish their goals, government can consider the regulatory recommendations noted below, possibly entrenching these in the occupational trades policies to impose obligations on SDPs and work on including other innovative policies.

Four participants emphasised issues relating to regulations and policies that oversee teaching and training of occupational trades. Participants further indicated that the Government Department responsible for occupational trades should be the driver for the adoption of blended learning in the teaching and training space.

> *Quality Council was a bit accepting of this approach, remember, Education and Training Authorities are key in that they are the ones funding the training and did not move into the new space, So SDPs are likely to listen to the body that funds them…* (PMEI01)

> *Government must revisit its policies on issues of allocating funds for training, learner stipends are below the minimum wage and also revisit the General Education and Training (GET) system, they need to teach learners important aspects such as budgeting skills.* (SCMI01)

Education and Training Authorities need to engage the industry, so they can advise what needs to be in a curriculum, hence the country can have same standards… (TMI02)

It should be driven from the Department of Higher Education and Training, not to be implemented by them, as they also lack the capacity to implement, they can mobilise the sector of education and training authorities by starting giving them targets around offering blended mode training, once they move into that direction then the financial resources will be unlocked as it will be set as a target. (TMI03)

6.6.6 Industry participation.

This recommendation was extracted from the findings of the study, to the effect that industry participation is central to occupational trades success. It was emphasised that industry is not involved in curriculum development for occupational trades, as a result of which the country qualifies artisans with outdated technological knowledge and is not training learners in line with the skills shortage.

The SDPs are rendering service to the industry; they must start moving fast towards the digital system. The parties need to engagement. Move with technology as most SDP remain with old technologies that are outdated not relevant for the market. (TMI01)

It's important that learner should be trained on relevant components the reality of what is happening within the industry. (TMI02)

Enrolment of learners occurs without verifying the availability of workplaces for the learners to cover the on-job component… Once government get things right by registering all qualified artisans on a database and be linked to the businesses in South Africa, it will be knew how many people the country can train and invest according to available placement or the shortage of artisans. (TMI04)

6.7 Suggestions for further research

The Quality Council for Trade Occupations (QCTO) needs to conduct an in-depth study into blended learning and how this can be formally integrated into the existing training schedule for trades training. During the Covid-19 pandemic, SDPs were deploying any available online platforms for the continuation of teaching and training, with these differing by provider. Researchers also need to explore both the potential and the limitations of blended learning. The Department of Higher Education and Training can infuse this approach through training regulations and policies, allowing proper adoption. In addition, future researchers will need to study the perceptions of learners regarding digital transformation in terms of all their technological requirements.

6.8 Conclusion

In conclusion, this study aimed to understand perceptions regarding blended teaching and training methods for trades education in South Africa. Findings from the study suggest that with proper knowledge and consideration, blended learning can be integrated into trades training. The Covid-19 pandemic meant that while theoretical knowledge was adequately understood, the use of a blended approach was limited. Facilitators are still a key part of blended learning. They need expertise in the subject matter and to have basic technology skills, with pedagogies that relate to technology. The limited knowledge and experience of facilitators is a major barrier as this affects the delivery of lessons. The study further points to a lack of budget and technological resources, plus resistance from facilitators, as hindering digital transformation. Other blended teaching barriers relate to the non-availability of relevant online platforms that directly include trades curricula. However, there are recognised technologies within the domain of extended reality technology that have the capability to combine physical workshops with online platforms that can interact and create a simulation environment for teaching and training.

Further research is necessary for the advancement of blended teaching and training in the education space.

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APPENDIX A: Interview Guide

Interviewer: Morokomobe Semond Monareng

Designation: Master's Student

School of Digital Business

University of the Witwatersrand, Johannesburg

Place of Interview: _____

Date and Time of Interview: _____

Questions:

1. What is role of senior management in formulating the learning framework?
2. How did the Skills Development Provider function during the pandemic crisis?
3. What are the targeted approaches for keeping the Skills Development Provider open when the world faced unexpected crisis?
4. What is your understanding of blended learning?
5. Has the Skills Development Provider (SDP) adopted blended learning?
    5.1. If the answer is yes, what motivated you?
    5.2. If the answer is no, what are the challenges faced by the Skills Development Provider (SDP) towards the adoption of blended learning?
6. What are the factors affecting blended learning?
    6.1. How do you think it can be turned around?
7. What technologies are implemented to deliver the blended learning approach?
8. Which Internet connectivity options are available to learners and facilitators?
9. What interventions are required to implement the blended learning approach?
10. Have you heard of extended reality (augmented and virtual reality)?
    10.1. Do you think it can be a solution to your challenges currently faced by the Skills Development Provider (SDP)?

APPENDIX B: Participant Information Sheet

Dear Sir / Madam,

My name is Morokomobe Semond Monareng and I am a master's student in the School of Digital Business at the University of the Witwatersrand, Johannesburg. I'm currently conducting research on perceptions of blended teaching and training methods in trades education in South Africa, under the supervision of Prof. Rene Pellissier. The aim of this research project is to find out the extent to which blended learning will transform how training is currently delivered and come up with a coordinated approach.

I would like to invite you to participate in an interview as part of the above research study. Kindly note that by accepting this invitation it means you have volunteered to participate and feel free to indicate your withdrawal at any time as there is no pressure to accept the invitation. The interview will take approximately 30 – 40 minutes; during the online interview I will request to record the session only if you agree to the request.

The research will not affect the Skills Development Provider (SDP) negatively; the data collected will be used only for the purpose of this study and the data will be kept by the University as per the data protection rules.

All the data you provide will be anonymous and confidential and data collected will not be traced back to you as a participant. This will be treated as a broad sample from Skills Development Providers (SDPs) in South Africa.

If you require further clarity, you are welcome to contact the researcher.

Should you have any concerns or queries regarding the research process, please feel free to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0)11 717 1408, email hrecnon-medical@wits.ac.za

Yours sincerely,

Morokomobe Semond Monareng

Researcher:

Morokomobe Semond Monareng, 1000363@students.wits.ac.za, 079 637 2407

Supervisor:

Prof. Rene Pellissier, rene@pellissier.co.za, 060 668 4503

APPENDIX C: Consent Form

Perceptions of blended teaching and training methods in trades education in South Africa

Morokomobe Monareng

I confirm that I understand the reasons for my participation in this research study	YES	NO
I agree to take part in the interview	YES	NO
I agree that the researcher may use anonymous quotes in his / her research report	YES	NO
I agree to the interview being audio recorded	YES	NO
I agree to digital pictures being taken while the interview is conducted.	YES	NO
I understand that my participation is voluntary and that I can withdraw at any time.	YES	NO
I understand that data provided may be used anonymously after this study	YES	NO

Name of participant: ……

Signature: …….

Date: ……

Name of researcher: ……

Signature: ……

Date: ……

APPENDIX D: Ethical Approval

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School Ethics Committee
Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/DB1000363/411
This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

This certificate is only valid if accompanied by formal permission from the relevant stakeholder(s).

Project title	Perceptions of blended teaching and training methods in trades education in South Africa
Investigator / Researcher	Ms Morokomobe Monareng
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed confidentialty.
Issue Date of Certificate	2023-01-18
Expiry date	Date of submission of the project / research report
Chairperson	Prof Anthony Stacey ☎ +27 11 717 3587 +27 82 880 4531 anthony.stacey@wits.ac.za

Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.

Signature

19/01/2023
Date:

merSETA
MANUFACTURING, ENGINEERING AND RELATED SERVICES SETA

Enquiries Rajesh Jock
Email: RJock@merseta.org.za
Tel: 010 219 3345

Ms. Semodi Monareng
Client Relations Manager
merSETA
By email: semodimonareng@outlook.com
By email: Dkhoza@merseta.org.za

23 February 2023

Dear Ms Monareng

RE: MS MONARENG REQUEST FOR PERMISSION TO CONTACT AND COLLECT DATA FOR RESEARCH PURPOSES

The email from Ms Khoza, dated 14 February 2023, bears reference.

Having considered the list of providers whom you have requested permission to contact for data collection purposes only, permission is hereby granted.

Please note that the permission is granted solely for the purposes of data collection related to your studies. Should it be established that contact was made other purposes, said contact will be viewed as a contravention of your conditions of suspension.

Yours sincerely

Mr Rajesh Jock
Corporate Services Executive

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