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# Perceptions of Women in Science Students towards Online Instruction at A Tertiary Institution

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**ABSTRACT**: This study delved into the nuanced perceptions of women in science students regarding online instruction at the tertiary level. The study adopted a qualitative paradigm where interviews and questionnaires were used to collect data from Chinhoyi University of Technology undergraduate women in science students. Data was collected from first year students to third year students aged between 19 and 26 years. Discussion of the findings is premised on the feminist approach to enable downscaling and understanding of the perceptions of women in science education on online learning experiences more holistically. Regardless of the benefits and advantages online learning has as opposed to traditional/physical learning, vulnerability, and resistance of women in science students at Chinhoyi University of Technology in the Institute of Materials Science Processing and Engineering Technology is worsened. The study found out that the great difference in how the women in science students perceive their experiences is hinged upon the student's background, the age gap, academic level, geographical location and even technology proficiency. A gap in knowledge persists in the exploration of the nuanced challenges faced by women in science when transitioning from traditional classroom instruction to online learning at the tertiary level was identified in the study resulting from the socio-economic challenges that the students are experiencing. Insights from this study contribute to a deeper understanding of how women in science navigate online education, offering valuable considerations for educators, policymakers, and institutions striving to create inclusive and effective learning environments.

**KEYWORDS:** Women in Science, Online Learning, Classroom Instruction, Tertiary Institution, Gender Bias, Stereotyping.

## 1. INTRODUCTION

In recent years, the integration of technology into education has rapidly transformed traditional instructional methods across the globe. Online instruction, characterized by its flexibility and accessibility, has gained prominence as an alternative mode of learning, particularly in tertiary education. This shift has been even more pronounced in the wake of the COVID-19 pandemic, which prompted educational institutions worldwide to shift towards online learning platforms to ensure the continuity of learning. While the adoption of online instruction holds immense potential, it is essential to investigate how different student groups perceive this transition, particularly in fields that have historically been underrepresented by certain genders, such as science and technology. Zimbabwe, like many other countries, has been grappling with the challenges posed by the digital divide and gender inequality. The nation's higher education landscape has witnessed a growing emphasis on science and technology disciplines as drivers of economic development and innovation. Despite efforts to promote gender equality, women's representation in these fields remains disproportionately low.

The term online education is often associated with Internet education, virtual education, cyber-learning, and asynchronous learning (Office of Sustainable Development, 2000). Kearsly (2000) reported the following themes that shape online education: collaboration, connectivity, student-centeredness, unboundedness, community, exploration, shared knowledge, multisensory experience, and authenticity. Volery (2000) also concluded that online delivery is a form of distributed learning enabled by the Internet. According to Paulsen (2002), online education is characterized by: a) the separation of teachers and learners (which distinguishes it from face-to-face education), b) the influence of an educational organization (which distinguishes it from self-study and private tutoring), c) the use of a computer network to present or distribute some educational content and d) the provision of two-way communication via a computer network so that students may benefit from communication with each other, teachers, and staff. Regardless of the definition, an early indication of the widespread popularity of 862 online education courses can be found in a survey conducted by the U.S. Department of Education, which revealed that more than 54,000 online education courses were being offered in 1998, with over 1.6 million students enrolled (Lewis, et al., 1999). In a more recent study, the World Health Organization (WHO) (2022) reported that: the global societal impact of the COVID-19 pandemic is incalculable with profound

social suffering, deep economic hardships and enforced closure of schools, businesses, and higher learning institutions through the imposition of lockdown and social distancing in mitigation of the spread of the SARS-Cov-2 infection. Institutions have had to hastily migrate teaching, learning and assessment to online domains, at times with ill-prepared academics, students, and institutions and with unwelcome and disorienting consequences. This research examined the positive and negative effects of online learning on the academic performance and career aspirations of women in science at a tertiary institution.

As an alternative to the traditional face-to-face classroom instruction, many universities and colleges globally have opted for online courses as a viable option as the world is now becoming paperless and there is also a rapid development of the internet. The offering of online courses, especially to female students, has created more opportunities to build more confidence, exhibit subject mastery, and establish a sense of belonging with their peers, despite their cultural, ethnic, or even physical differences. As a result, more women worldwide are beginning to enter male-dominated majors and career tracks. However, going to a specific location, at a specific time, is said to be what puts most students in the learning mindset and helps them concentrate. This is the reason for the worldwide popularity of face-to-face learning. Online education, according to Harasim (1989), is a new domain of learning that combines distance education with the practice of face-to-face instruction utilizing computer-mediated communication. Ascough (2002) suggested that online education has the following features: (a) it provides a learning experience different from the traditional classroom because learners are different, (b) the communication is via computer and World Wide Web, (c) participation in the classroom by learners is different, (d) the social dynamic of the learning environment is changed, and (e) discrimination and prejudice is minimized. New technologies, the Internet, streaming video, net-meeting and others now make higher education more accessible and affordable for many students, and for those who would have been unable to pursue higher education in a traditional in-class setting (Bianco and Carr-Chellman, 2002). Consequently, online learning has now become an integral part of higher education institutions' expanding curriculum worldwide.

Regionally, online learning has become a key mode of instruction delivery in higher education institutions, driven by the increased costs of conventional education, and decreased costs of storing and transmitting information electronically (Çakiroğlu, 2014). According to Bharuthram and Kies, (2012), many current university students are techno-savvy and are competent social networkers, but many African students are from disadvantaged backgrounds with poor socio-economic conditions and inferior schooling. This creates a problem as the associated low literacy levels and restricted access to computers apart from smartphones, hinder the effectiveness of online learning as a teaching medium. Women's education in this region has generally been affected by traditional and cultural barriers which tend to prioritise male children as the ones that are entitled to receive education. Conversely, online learning is viewed as a means of reaching such students. In addition, Bharuthram and Kies (2012) found that it is academically strong students from privileged backgrounds who enjoy online learning and its benefits. A path that accommodates the disadvantaged student, as well as the techno-savvy, must therefore be negotiated without compromising quality in teaching and learning. With the negotiated pathway, online learning can reduce the stress and pressure that women in science may experience from juggling multiple roles and responsibilities in their lives. Therefore, online learning can enhance the academic performance and career aspirations of women in science by providing them with more flexibility and convenience. It will also create an environment of inclusion both in social and educational settings.

With online courses and degrees having been widely adopted by higher education institutions as another method to substitute traditional classroom instruction in Zimbabwe, challenges to this method have been of great concern to women, especially in the science field of study. World history has been reshaped by global change and it has affected every field especially with the coming of the pandemic (COVID-19) in Zimbabwe, as this is the period that online courses became prominent/ trendy in the country. As suggested by Razami and Ibrahim (2021), with the transition to distance education, new problems began to emerge as the adaptation was employed in the field of science education. It has been impossible for students who are economically disadvantaged or lack technological opportunities such as the Internet or even computers to attend online classes (Razami and Ibrahim, 2021). Students, teachers, academics, and administrators who were not used to this new educational structure tried to find a solution to the problem and it was even more difficult, especially with the need for conducting laboratory experiments as part of the science learning (Owusu-Fordjour et al., 2020). The introduction of science, technology, engineering, and mathematics (STEM) fields in Zimbabwe plays a crucial role in shaping the progress and development of societies. Moreover, to educate a female is to educate a whole family and what is true of families is also true of communities and ultimately the whole country thus allowing females greater control of their lives (UNICEF, 2000). Regardless of the conflicting discourse, the decline in the number of female students enrolling to do online science lessons is not unique to Zimbabwe alone but it is a worldwide phenomenon. Numerous studies (Angell, Guttersrud, Henriksen, & Isnes, 2004; Lyons, 2006; Owen, Dickson, Stanisstreet, & Boyes, 2008), have shown that women are greatly under-represented in the field of sciences in several countries. There is low participation of female students in science and even education in Zimbabwe when 52% of the population are women (National Gender Policy, 2013). For example, in 2011, the national statistics showed that only 15.98% of the students who were doing sciences in Zimbabwe were enrolled on online courses and this is because of the challenges of resources (UNICEF, 2012).

## 2. STATEMENT OF THE PROBLEM

In recent years, advancements in technology have led to a significant shift towards online instruction methods within the education sector, and this has led to the problem of the digital divide and access disparities. The problem of the digital divide and access disparities significantly affects women in science studies at tertiary education level. Statistical data reveals that as of 2021, nearly half of the global population (46.4%) still lacked access to the Internet, with the gender gap being particularly pronounced in low- and middle-income countries (ITU, 2021). This digital gender gap can be attributed to various factors, including limited access to technology and devices, lower digital literacy rates among women, and cultural barriers as the women who are studying in the comfort of their homes have divided attention. In tertiary education, these disparities manifest as women in science students face challenges in accessing online learning platforms, participating in virtual classes, and engaging with course materials. In the context of science studies, the lack of access to necessary online resources and tools can hinder their ability to conduct research, complete assignments, and fully participate in remote laboratory activities. Tertiary institutions have increasingly adopted online platforms for course delivery, including in science-related fields. However, there is a need to explore how this transition to online instruction is perceived by specific demographic groups, such as women in science. Despite progress towards gender equality in various domains, there is a persistent under representation of women in science, technology, engineering, and mathematics (STEM) fields, thereby limiting women's opportunities to engage in digital learning experiences that have become integral to contemporary education. This study aimed at investigating the perceptions of women enrolled in science programs at a tertiary institution regarding online instruction, seeking to identify the benefits, challenges, and overall attitudes of these students towards online learning platforms.

## 3. RESEARCH QUESTIONS

The study was guided by the following research questions.

- Why is there exclusive use of online learning by women students in science?
- What are the benefits of online learning?
- Which challenges are faced by women in science?

## 4. LITERATURE REVIEW

### 4.1 Theoretical Framework

Feminist theory, as a robust and critical framework, serves as a powerful lens through which to analyze the experiences of women in science students navigating the landscape of online learning. Rooted in the pursuit of gender equality and the examination of power dynamics, feminist theory provides a comprehensive framework to explore how women in science engage with and are shaped by online educational environments. At its core, feminist theory prompts a critical inquiry into the power structures that have historically marginalized women in science. Within the realm of online learning, this theoretical lens encourages an examination of whether virtual spaces reinforce or challenge existing hierarchies. By employing feminist principles, this study seeks to unveil how power imbalances influence the experiences of women in science within the digital realm, shedding light on the dynamics that may shape their engagement with online education.

The theory emerged from the Marxist arguments that, “people from an oppressed class have special access to knowledge that is not available to those from a privileged class” (Collins, 2014). Furthermore, feminist theory prompts an exploration of gendered expectations and norms. As women in science transition to online learning platforms, questions arise regarding the ways in which these digital spaces either replicate traditional gender roles or provide avenues for women to challenge and redefine these expectations. Through the feminist lens, the study endeavors to unravel the nuanced gender dynamics within the digital context of science education, offering insights into the ways in which online learning may contribute to or challenge existing gender norms.

According to Harding (1986), the concept of intersectionality, a key tenet of feminist theory, is instrumental in understanding the multifaceted experiences of women in science in online learning environments. Recognizing that gender intersects with other identity markers, such as race, ethnicity, and socioeconomic status, the study employs an intersectional feminist framework to unveil the unique challenges faced by women with diverse identities. This approach allows for a nuanced exploration of how intersecting identities shape the experiences of women in science within the digital educational landscape. This is supported by Dorothy Smith who argued that “women are ignored and objectified thus making them the other.” She also claims that “women’s experiences are fertile grounds for feminist knowledge and that by grounding sociological work on women’s everyday experiences, sociologists can also ask new questions” (Smith, 1987).

Feminist theory's emphasis on agency and empowerment is particularly relevant in the digital realm. The study investigates whether online learning provides a platform for women in science to exercise agency over their education and how digital spaces contribute to or hinder their empowerment. By applying feminist frameworks, the research aims to uncover the extent to which online learning can be a tool for empowerment within the specific context of science education.

Ultimately, feminist theory serves as a guide for this study in challenging and transforming systems that perpetuate gender-based inequalities. In the digital age, the theoretical framework explores whether online learning platforms contribute to systemic change

or inadvertently replicate existing gender inequalities. The study, grounded in feminist principles, seeks not only to understand the experiences of women in science in online learning but also to contribute to broader discussions on gender and education within the dynamic landscape of the digital age.

### 4.2 Concept under discussion

Research on the perceptions of women in science students towards online instructions at tertiary institutions reveals a complex picture. Price (2006) challenges stereotypical views of women in online courses, highlighting their confidence and independence as learners. Kimani (2013) emphasizes the need for tailored online support for female science and technology students in Africa, including Kenya. Amponsah and Mohammed (2019) underscores the goal-oriented nature of female STEM students in Ghana, despite the challenges they face. Thang and Bidmeshk (2010) further explores the perceptions of undergraduates towards online courses, finding that they perceive these courses as beneficial for improving their skills and strategies, autonomy, and motivation. These studies collectively suggest that while women in science may face unique challenges, they are generally positive about the potential of online instructions to support their learning.

Historically, the landscape of education, including science disciplines, has been marked by systemic gender disparities. According to Campbell (1996), traditional views often marginalized women in science, limiting their access to educational opportunities and professional advancement. In the historical context, online learning was not a prominent consideration, and the prevailing norms tended to reinforce traditional gender roles. Women faced hurdles in accessing higher education, and science, being a predominantly male-dominated field, further exacerbated the challenges (Campbell, 1996). Consequently, there was limited exploration or consideration of the exclusive use of online learning platforms by women in science students. The historical context framed women's engagement in education primarily within the confines of physical classrooms and institutional structures, with minimal acknowledgment of alternative modes of learning.

As suggested by Gudyanga (2016), in more recent times, the advent of online learning has presented a paradigm shift in educational possibilities. Contemporary perspectives recognize the potential of online learning to break down barriers and provide more inclusive access to education. However, the question of the exclusive use of online learning by women in science students is complex and multifaceted. On one hand, online platforms offer flexibility and convenience, potentially leveling the playing field for women who may have faced historical disadvantages. They provide opportunities for remote learning, accommodating the diverse life roles that women often navigate. UNESCO (2019) posits on the other hand that contemporary views acknowledge that challenges persist. Gender biases and stereotypes can manifest in online spaces, affecting the experiences of women. Additionally, access to technology and digital literacy may not be uniform, potentially creating disparities among women in science in their ability to engage exclusively in online learning.

As online learning becomes more ubiquitous, the views on its exclusiveness for women in science students continue to evolve. Emerging trends suggest that the digital divide is gradually narrowing, with increased access to technology (Sachdev, 2018). However, complexities arise concerning the intersectionality of identities, as women's experiences are shaped not only by gender but also by factors such as race, ethnicity, and socioeconomic status. Contemporary discussions must grapple with these complexities and recognize that exclusiveness, or lack thereof, is influenced by a web of intersecting factors. Xu (2016) states that contemporary perspectives emphasize the need for equity in online education, ensuring that the benefits of online learning are accessible to all, irrespective of gender or other identity markers. Addressing challenges related to inclusivity, representation, and biases in online learning platforms is integral to fostering an environment where women in science cannot only participate but thrive in their educational pursuits.

### 4.3 Existence of exclusive use of online learning by women in science students

According to various studies, the trends in education have evolved and it is evident that new developments and changes in how classes are conducted have emerged and this also includes the use of online methods amongst other mediums. According to UNESCO (2019), the adoption of online learning often depends on various factors, including the institution’s policies, the nature of the academic program, and the external preferences of individual students, and other external factors such as the COVID-19 pandemic, which has accelerated the adoption of online education in many places. Paul and Jefferson, (2019) posit that the increasing prevalence of online learning platforms has brought forth questions and concerns regarding its impact on different student populations. The researcher aims to explore the reasons behind the exclusive use of online learning by women in science students. Understanding this phenomenon can shed light on potential barriers and benefits associated with online learning for women pursuing science education.

Online learning offers flexibility in terms of time, location, and pace of learning. This factor is particularly beneficial for women in science students who may face additional responsibilities such as caregiving, household duties, or work commitments. Numerous studies have explored the experiences of women in science and the impact of different instructional settings on their participation and success. According to Brasca, et al., (2022), online learning has been found to offer flexibility and convenience, enabling women in science to overcome barriers such as geographical constraints and balancing multiple responsibilities. Studies have highlighted the positive aspects of online learning, including access to resources, self-paced learning, and opportunities for

asynchronous collaboration. This has made learning to be more inclusive and more accessible especially to women and young girls even during and after the pandemic, as a growing number of students are now opting for online classes. The above then suggests that online education can provide an opportunity to balance various roles and commitments, making learning more accessible for women.

As suggested by Paul and Jefferson (2019), the advent of online education has made it possible for students with busy lives and limited flexibility to obtain quality education. As opposed to traditional classroom teaching, Web-based instruction has made it possible to offer classes worldwide through a single Internet connection. Online education seems to be the pathway for women that are seeking to secure better education yet with other challenges and cultural responsibilities that are bestowed on them through the community. Mozes-Carmel and Gold (2009) posit that prospective students want to be able to receive a quality education without having to sacrifice work time, family time, and travel expenses. Instead of having to be at a specific location at a specific time, online education students have the freedom to communicate with instructors, address classmates, study materials, and complete assignments from any Internet-accessible point.

### 4.4 Benefits of online learning

Online learning has emerged as a transformative force in education, offering a myriad of benefits that cater for the evolving needs of diverse learners. According to Howes (2002), one of the primary advantages is flexibility. Learners, including a significant number of women in science, can engage with course materials at their own pace and at times that suit their individual schedules. This flexibility is particularly valuable for those managing multiple commitments, whether they be work-related, research-oriented, or family responsibilities. It breaks away from the constraints of traditional classroom settings, providing a more accommodating and personalized learning experience.

Lynch (2000) posits that a closely linked benefit is the accessibility that online learning provides. Students are liberated from the limitations of geographic proximity to educational institutions. This democratization of access is particularly relevant for women in science, who may find themselves in regions with limited opportunities for specialized scientific education. Online courses bring world-class instruction to the fingertips of learners, fostering inclusivity and diversity in academic pursuits.

The diversity of learning materials and resources is another compelling advantage of online learning. Through multimedia presentations, interactive modules, and a wealth of digital resources, learners can engage with content in a variety of ways (Smeding, 2012). This appeals to different learning styles, ensuring that the material is not only accessible but also comprehensible and engaging. Women in science, who may have diverse backgrounds and preferences in learning, benefit from this adaptable approach that caters for various ways of processing information.

Online learning contributes significantly to cost savings and efficiency. Xu (2016) suggests that the elimination of commuting costs and the need for physical infrastructure makes education more affordable. Learners can access high-quality courses and programs without the added financial burden of relocation or travel. For women in science who may be pursuing advanced degrees or professional development opportunities, this financial efficiency is a noteworthy advantage that aligns with their career aspirations.

The global collaboration and networking opportunities facilitated by online learning platforms are pivotal in a connected world. According to Brotman and Mensah (2008), women in science can engage in discussions, collaborations, and networking with peers, mentors, and professionals worldwide. This interconnectedness not only enriches the learning experience but also opens avenues for collaboration on research projects, sharing insights, and building a global community of professionals in science.

In the context of the evolving job market, online learning equips learners with digital literacy and technological skills. The use of various online tools and platforms becomes second nature, preparing individuals, including women in science, for the demands of the digital age (Howes, 2002). This proficiency in navigating digital environments is not only relevant for academic pursuits but is also increasingly crucial in the professional landscape.

In conclusion, online learning stands as a beacon of educational innovation, offering flexibility, accessibility, diverse learning experiences, cost-effectiveness, global networking opportunities, and the development of crucial digital skills. These benefits collectively redefine the educational landscape, making learning a dynamic, inclusive, and empowering endeavor for individuals, especially women in science, as they navigate their academic and professional journeys.

### 4.5 Challenges that are faced by the women in science

Women pursuing careers in science continue to encounter a range of challenges that hinder their progress and limit their opportunities within the field. One prevalent challenge is the persistent gender bias and stereotypes. As suggested by Hill, Corbett, and Rose (2010), deep-seated societal expectations often cast women in science in stereotypical roles, impacting how their contributions are perceived. Stereotypes can lead to biases in hiring, promotion, and recognition, creating barriers for women striving to advance their careers in scientific disciplines.

Another significant challenge is the underrepresentation of women in leadership roles. Holland and Lave (2009) suggest that the scarcity of women in top positions within academic institutions, research organizations, and industry settings reflects systemic

barriers that limit their access to leadership opportunities. The lack of visible role models can further discourage women from envisioning themselves in leadership positions, perpetuating a cycle of underrepresentation.

Work-life balance remains a considerable challenge for women in science. As suggested by Paul and Jefferson (2019), the demanding nature of scientific research and academia, coupled with traditional gender roles and expectations, can create challenges for women balancing careers with family responsibilities. The pressure to meet stringent deadlines, publish research, and attend conferences can conflict with societal expectations around caregiving, impacting women's ability to navigate both personal and professional spheres successfully. The two scholars are also of the view that discrimination and bias manifest in the form of the gender pay gap, where women in science often earn less than their male counterparts for comparable work (Paul and Jefferson, 2019). This financial disparity not only affects the economic well-being of women but also perpetuates a cycle of inequality within the scientific community. Closing the gender pay gap is not only an issue of fairness but also essential for fostering a diverse and equitable scientific workforce.

The academic environment itself can pose challenges, particularly in fields where a lack of representation of women is pronounced. Women may face isolation, a sense of not belonging, and challenges in forming professional networks. The scarcity of female colleagues and mentors can hinder the development of supportive communities critical for career advancement (Holland and Lave, 2009). Furthermore, implicit biases in hiring, promotion, and evaluation processes contribute to the challenges faced by women in science. Unconscious prejudices can influence decision-making, leading to disparities in opportunities and recognition. Addressing these biases requires a concerted effort to implement unbiased evaluation practices and promote diversity and inclusion at all levels.

Harassment and discrimination persist as serious issues, with women in science reporting experiences of gender-based harassment, bullying, and exclusion. Such hostile work environments can contribute to a toxic culture that hampers the well-being and professional development of women in scientific fields.

In conclusion, while progress has been made in recognizing and addressing the challenges faced by women in science, there is still much work to be done. Overcoming gender bias, fostering inclusivity, and creating supportive environments are crucial steps towards ensuring that women can fully contribute to and thrive in the field of science. Advocacy for gender equality, mentorship programs, and institutional policies that promote diversity and inclusion are essential in mitigating these challenges and creating a more equitable scientific landscape.

## 5. METHODS

1 This qualitative research was guided by interpretivist philosophy to case study the Perceptions of Women in Science Students towards Online Instructions in the Institute of Materials Science Processing Engineering and Technology at the Chinhoyi University of Technology. Data were collected using structured interviews and open-ended questionnaires from a purposive sample of fifteen (15) randomly selected women students from the Institute of Material Science Processing Engineering and Technology. Prior to data collection, permission to carry out the research was sought from the University authorities following which a pilot study was conducted to validate the research instruments. Data were presented, analyzed, and discussed thematically using the NVivo software. In analyzing and discussing the prominent themes, arguments and findings arising from the data, the research also referred closely to the literature.

## 6. RESULTS AND DISCUSSION

### 6.1 Demographics of research participants

A total of 70 students (including both male and female students) are enrolled in the Chinhoyi University of Technology Institute of Materials Processing and Engineering and Technology, of which about 36% of the total population are women/female students from all over the country. During the conduct of the research, the researcher noted that the experiences of female students in the University are greatly determined by their backgrounds, the age gape, academic level, geographical locations and even technology proficiency. The female population in the department consists of many girls and a few mothers (about 3-7 members). Their experiences are also influenced by their secondary educational backgrounds and locations where the majority of the population attended schools that had less technology when it comes to conducting experiments and even doing online research. A total of 15 respondents participated in the research. Six (6) of the participants were in their first year, 5 were in their second year and 4 were in their third year of study in the BSc degree in Material Processing and Engineering and Technology. Questionnaires and interviews were used to gather data. One on one interviews were conducted with 4 of the participants. Each year of study in the university was represented by one interviewee. The participants came from various family/societal backgrounds. The oldest participant was aged 26 years and the youngest was aged 19 years. The sample population that the researcher used in conducting the research represented the total population of the women in science students and their experiences were generalised as the perceptions of women in science students towards online instructions at a tertiary institution.

**6.2 Awareness of learning methods at the university**This exploration of the participants' awareness of learning methods at the Chinhoyi University of Technology provides a foundation for understanding the institutional context in which online learning is unfolding. The researcher considered the effectiveness of communication strategies, the provision of resources, and the overall support structures in place to facilitate a smooth transition to online education especially in the department of science. The insights gained from this section contribute to a holistic understanding of the broader educational environment shaping how women in science students perceive online instructions at a tertiary institution. Participants' awareness of the availability of educational resources both online and offline, was assessed. This included access to digital libraries, online databases, and other resources that support their learning. Understanding the participants' awareness of the learning methods at the university was a crucial aspect of exploring their perceptions in online education.

**6.3 Women students and online learning experiences in the university**

In relation to women students and online learning the researcher noted that, the perceptions and experiences of the women in science students in the university are different and that their integration into the university community is also different. Their online learning experiences within the University were explained in one-on-one interviews and the participants narrated their various perceptions with a passion. A participant in third year at the university had this to say:

*For us, online learning has never been an issue as we have grown to like it and understand it better especially with the coming of COVID-19 pandemic. We may have other challenges like ZESA schedules and even data for the internet, but we love the idea that lectures are now more flexible and convenient. We all can have access to the class modules and use recorded materials over and over again even in situations where we were most likely absent in physical lectures (22-year-old respondent: level 3.2 student)*

Participant from a different year level also engaged in the discussion and added that:

*…. we appreciate online learning especially now when there is a ramped in the outbreak of diseases and where social gatherings and even classes are prohibited. As women and young girls with dreams and achievements, outbreaks were generally a setback in our career plans and goals, as we are also expected to carry out other societal and household duties at certain ages, thus cancelling and shutting down of lecture halls was a setback as it meant we would graduate later than expected. (20-year-old respondent: level 2.1 student)*

As the researcher continued to interact with the women students in science, another participant made a comment on the learning experiences and the advantages it gave to the girl child especially in terms of harassment and emotional abuse. She had this to say:

*Online learning is okay because it reduces chances of harassment especially physical sexual harassment. With some of us being able to enrol in the department of science and also being women, we have faced a lot of physical harassment from the lecturers as well as from male students due to our age and appearances, and also the idea that women should belong in the arts departments has been a toll on us emotionally as we were never seen as competent as the male science students. (26-year-old respondent: level 3.2 student)*

The issue of online learning experiences was a sensitive area such that it received different responses that the researcher gathered during the interviews and from the questionnaires. Another participant explained her perceptions and experiences as follows:

*I feel like the traditional way of attending lectures is better than online because of our economy that is challenging. Some of us come from a very rural and poor background and our parents are selling cows for our education which is now being substituted by methods we cannot afford. I am from Gokwe and sometimes network is a problem, data is even a much bigger problem as it is way expensive for me to attend the online classes, and to make matters worse, I have no access to the computer or even advanced smart phone that will help me be in sync with the other students. Understanding of the concepts taught online is low compared to when in a physical lecture set-up, I consider it a waste as I find myself not understanding a thing after the lecture, as most of the times I will be struggling to connect during the scheduled lecture time (19-year-old respondent: level 1.1 student).*

**6.4 Impact of online learning on women's participation in the scientific disciplines**

In relation to the impact of online learning on women's participation in the scientific disciplines, participants who answered questionnaires narrated various benefits and different experiences they had socially and educationally in the University.

In gathering the data, various issues were observed by the researcher, and these have an effect on the perceptions that women in science students have when it comes to online learning. The women in science students feel that in as much as the online learning has bridged the distance gap, time differences and locations, the method has also limited the practicality of the study in question as much of the learning is in practice not theory. A participant in this discussion explained her experiences:

*I believe that online learning has bridged the gap in time differences, locations etc, meaning that women in science have been able to extend boundaries and scope, spread their wing globally, we are also now able to connect with other international students and share ideas, however we are not yet advanced as a university technology wise to be able to fully participate in online experiments and even online labs like other countries which is a great disappointment and a setback in our academic endeavours in the sciences department. (22-year-old participant: level 3.2 student)*

Another participant described her perception and experience in taking online lessons at the university as follows:

*…. some of us cannot express themselves better in public/ physical classes. We actually prefer online classes because we can say our thoughts and participate well without fear of judgement and even being labelled as nerd. I can get in my class and be off camera, that way I can express myself better and participate even more than when I attend lectures physically. (20-year-old participant: level 2.2 student)*

The answers to the questionnaires given out by the researcher showed that the women in science students are also getting empowered, and recognised in the STEM programs. They have become more efficient in their work and are also now able to understand the trending technology that will better their chances in industrial attachment and future careers. One participant in the survey commented as follows:

*Online learning has given us a chance to shine and also improve socially and academically. We have really succeeded in our studies as there is much more availability to online sources in the scientific disciplines and the advantage is that they are really up to date and can make us competent to the requirements of the real world. (23-year-old participant: level 3.1 student)*

**6.5 Enhancing women's experiences of online learning**

In relation to the question of how women in science students think on ways that can be used to enhance their experiences of online learning, the participants' thoughts were in line with implementing strategies that addresses specific challenges that these women students are facing and also contribute to inclusive learning. A participant in this research process suggested that:

*… maybe if we are more exposed to computers and become computer literate it will help us in enjoying the lecturers more. I am of the view that the university should provide electrical and digital gadgets for all students, as this initiative will bridge the digital gender divide, and ensure that us as women have equitable access to technology, internet connectivity, and digital literacy resources. (21-year-old participant: level 2.2 student)*

Another participant suggested that:

*…. there is great need for training platforms that are gender-inclusive course designed and even introduce mentorship programs. This will help incorporate diverse perspectives, use inclusive language, and represent women's contributions in scientific examples and case studies. Also, establishing mentorship programs that connect women in science students with experienced mentors in their field. Having access to role models and mentors can provide guidance, support, and valuable insights into navigating both academia and professional life. (26-year-old participant: level 3.2 student)*

The students who participated in the research felt that the online lessons should be engaging through the use of videos, simulations, and games to keep the students focused on the topic under study. They felt that lecturers should introduce field trips as a demonstration of the concepts taught online and, also introduce online platforms that accommodate a large number of people to interact with. One participant said:

*I feel like the lecturers should create and promote online platforms that facilitate peer interaction and collaboration. Virtual study groups, discussion forums, and collaborative projects can help combat feelings of isolation and foster a sense of community among women in science students. (23-year-old participant: level 2.1 student)*

To support the above idea, another participant feels that:

*There is need to implement training programs to raise awareness about unconscious bias in online spaces. Educate instructors, administrators, and peers about the impact of gender bias and stereotypes, fostering a more inclusive and supportive learning environment. Ensure that support services, such as counselling, academic advising, and accessibility services, are easily accessible online. Provide resources specifically designed to address the unique needs of women in science students. (20-year-old participant: level 2.1 student)*

**6.6 Discussion of results**

This study revealed various perceptions and experiences of women students in science at Chinhoyi University of Technology currently enrolled in the Institute of Materials Processing and Engineering and Technology. The findings in the study are generally the voice of the female students that are studying sciences modules and their perceptions on online learning as compared to traditional/physical learning at the University. Their perceptions as presented in the results section are greatly influenced by various factors such as the women in science's background, the age gap, academic level, geographical locations and even technological proficiency. The findings of the study illuminate a nuanced picture of the experiences of women in science in the realm of online learning at tertiary institutions.

The research revealed that the general perceptions of women in science students at Chinhoyi University of Technology are influenced by the social and economic structure of the country. Issues to do with lack of access to online resources and lectures due to lack of digital equipment, network coverage or even mobile data availability have been major concerns in this study. According to Lyons (2006), these issues discussed are known as digital gender divide persists. The data supported this idea of digital gender divide persists as it reveals a persistent digital gender divide, with variations in technological access and proficiency among the women in science students. Disparities in internet connectivity, access to devices, and digital literacy contribute to uneven participation, echoing broader global trends in the digital landscape. The researcher noted that the potential vulnerabilities and perceptions of women in science are significantly different as flexibility of online learning also fights with the increased

workload. While flexibility of online learning is celebrated, the findings suggest a paradox. Women in science students appreciate the flexibility but note an unintended consequence, that is, an increase in workload. Balancing online coursework with existing responsibilities, including research or professional commitments, emerges as a significant challenge. In support of Harding (1986)'s view of the feminist standpoint theory, various research institutes lost sight of the real human relations and the true nature of social reality. This was true as the researcher observed that the relations between the women in sciences students were greatly determined by how they perceived life in terms of their social and economic backgrounds.

Online spaces and unconscious bias within the university depicted a certain level of human rights violation between the women and the men in the study of sciences online at the university, as some of the students mentioned the issue of harassment and emotional abuse in traditional lectures and felt that there was still that bias even in online classes. The researcher noted that unconscious bias in online spaces is a noteworthy challenge. Women in science students do report instances of gender bias and stereotypes affecting their experiences, highlighting the need for cultivating inclusive digital environments that actively address and counteract biases. Khanlou and Guruge (2008) suggest that the perceptions of women in science students towards online learning are identity constructed such that their social identities influence their perceptions. The researcher also noted that the intersectionality of identities, including gender, educational backgrounds, and the socio-economic status, introduces unique challenges. Women in science students with intersecting identities face layered barriers, emphasizing the importance of intersectional approaches in designing and implementing online learning programs.

Furthermore, the study shows that peer interaction emerges as a vital element in the online learning experiences of women in science. Collaborative activities, group discussions, and virtual networking opportunities positively contribute to a sense of community and combat feelings of isolation. As the UNICEF puts it, 'there is a general thinking that when learning is incorporated with physical activities that stimulate the brain, the outcome of the learning is often associated with success and safety and is easily adapted to as compared to just reading and writing' (UNICEF,2019). This is viewed as a universally acceptable approach to online learning as there is also scarcity of female role models and mentors continuing to be a significant factor impacting the experiences of women in science students. Having access to mentorship and guidance from women who have navigated similar paths is identified as a key element in fostering confidence and a sense of belonging. Due to the introduction of the STEM program, women have been greatly noticed in the field of sciences that was often felt to be dominated by men and this has made even the learning process to be innovative, inclusive, and engaging as the modules are also designed to fit and accommodate everyone within their sphere of influence and their peer interaction.

It is also important to understand that women in science students believe that the online learning method is effective as its impact has been positive especially during times of pandemics and also during lockdown periods. The researcher found out that despite the negative feedback due to the socio-economic structure of the country, women in science students at tertiary education level prefer online learning as it is viewed as an essential tool to navigate the new global digital world. From the presentation of findings, the participants reveal that online networking can be empowering for women in science. Engaging with a global community, accessing diverse perspectives, and collaborating on digital platforms contribute to professional growth and a broader understanding of their field. Participants express a need for gender-inclusive policies within academic institutions. These include flexible scheduling, parental support, and initiatives that actively address the specific challenges faced by women in science in the online learning context. The findings underscore the significance of institutional support structures, including clear communication, accessibility services, and mentorship programs tailored to the needs of women in science students engaged in online learning. The feminist theory helped in understanding the various issues that were raised by the women in science students at Chinhoyi University of Technology as the theory places a great emphasis on the thinking of these women students and their perceptions towards online instructions at a tertiary institution.

## 7. CONCLUSIONS

The findings suggest that women in science students exhibit varied experiences in online learning compared to traditional classrooms. While the flexibility of online learning is appreciated, it appears to come with a potential increase in workload. The digital environment fosters a sense of global collaboration and networking, but challenges such as gender bias and stereotypes persist and may impact the overall experiences of women in science students. The study also identifies several contributing factors to the exclusive use of online learning by women in science students. Notably, flexibility and convenience emerge as key drivers, accommodating the unique challenges faced by women in science, including work-life balance and geographical constraints. The COVID-19 pandemic and the global shift to remote working and learning have also played a role in the increased adoption of online education among women in science. Moreover, women in science encounter challenges in online learning that mirror broader gender disparities. The flexible nature of online learning can blur boundaries between personal and academic life, impacting work-life balance. Challenges include gender-based biases and stereotypes in virtual spaces, potential unequal participation, and the persistence of the digital gender divide. The scarcity of female role models and mentors remains a notable challenge, impacting the formation of supportive networks in the digital learning environment.

## 8. RECOMMENDATIONS

From the study on the perceptions of women in science students towards online instructions at a tertiary institution, in this case, Chinhoyi University of Technology, the researcher noted some important insights that might be used as recommendations for future research. These will be useful to all women in science students in all departments, the university authorities, lecturers and even government and NGO educational communities and may contribute to assisting the vulnerable women in science students in attaining their educational goals. The following recommendations are made:

- Educational institutions should proactively work towards creating gender-inclusive online learning environments. This involves implementing strategies to counteract gender biases, stereotypes, and ensuring diverse representation in course content. Additionally, fostering an inclusive virtual community that supports the unique needs and aspirations of women in science students is crucial.
- Educational institutions should also establish mentorship programs and virtual networking opportunities specifically designed for women in science students engaged in online learning. Connecting them with experienced mentors and peers worldwide can contribute to their professional development, offer guidance, and create a sense of community.
- Recognizing the challenges related to work-life balance, institutions should provide enhanced support structures. This may include flexible scheduling options for virtual classes, resources for time management, and family-friendly policies that accommodate the diverse responsibilities of women in science students.
- Address the digital gender divide by implementing initiatives that ensure equitable access to technology, internet connectivity, and digital literacy resources. Bridging this gap is essential for enabling women in science to fully participate and benefit from online learning opportunities.
- Educational institutions should formulate and implement gender-inclusive policies that specifically address the unique challenges faced by women in science students. This may involve flexible academic policies, initiatives to combat gender bias, and proactive measures to ensure equal opportunities for career advancement.

Given the dynamic nature of online learning environments, further research is needed to explore the long-term impacts of online education on the career trajectories of women in science. Investigating the effectiveness of specific interventions, such as mentorship programs or gender-inclusive course designs, could provide insights into best practices for supporting women in science in the digital realm. Additionally, comparative studies across different cultural and geographical contexts could offer a more comprehensive understanding of the global nuances in the experiences of women in science in online learning.

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## REFERENCES

1) Amponsah, D.K. and Mohammed, M.S., 2019. Perception of learning science: the case of females offering STEM majors in Ghana. *African Journal of Educational Studies in Mathematics and Sciences*, *15*(2), pp.141-154.
2) Angell, C., Guttersrud, Ø., Henriksen, E. K., and Isnes, A. (2004). Physics: Frightful, but fun. Pupils' and teachers' views of physics and physics teaching. *Science education*, *88*(5), 683-706.
3) Angell, C., Guttersrud, Henriksen, E.K. and Isnes, A., 2004. Physics: Frightful, but fun. Pupils' and teachers' views of physics and physics teaching. *Science education*, *88*(5), pp.683-706.
4) Ascough, R.S., 2002. Designing for online distance education: Putting pedagogy before technology. *Teaching theology and religion*, *5*(1), pp.17-29.
5) Bharuthram, S. and Kies, C., 2013. Introducing e-learning in a South African Higher Education Institution: Challenges arising from an intervention and possible responses. *British journal of educational technology*, *44*(3), pp.410-420.
6) Bianco, M.B. and Carr-Chellman, A.A., 2007. Exploring qualitative methodologies in online learning environments. *Online learning communities*, pp.299-317.
7) Brasca, C., Krishnan, C., Marya, V., Owen, K., Sirois, J., and Ziade, S., 2022. *How technology is shaping learning in Higher education.* Stanford School of Education.
8) Brotman, J.S. and Moore, F.M., 2008. Girls and science: A review of four themes in the science education literature. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *45*(9), pp.971-1002.
9) Cakiroglu, O. and Melekoglu, M.A., 2014. Statistical trends and developments within inclusive education in Turkey. *International Journal of Inclusive Education*, *18*(8), pp.798-808.

10) Campbell, P.B. and Storo, J.N., 1996. Teacher Strategies That Work for Girls and Boys. Math and Science for the Coed Classroom.Collins, R., 2014. Skills for the 21st Century: teaching higher-order thinking. *Curriculum and Leadership Journal*, *12*(14), pp.1-8.
11) Collins, R., 2014. Skills for the 21st Century: teaching higher-order thinking. *Curriculum and Leadership Journal*, *12*(14), pp.1-8.
12) Gudyanga, A., 2016. Zimbabwean Female Participation in Physics: Factors of Identity Formation Considered as Contributing to Developing an Orientation to Physics by Female Students. *Journal of Education and Practice*, *7*(26), pp.159-171..
13) Hajdukowski-Ahmed, M., 2008. *A dialogical approach to identity: Implications for refugee women*. na.
14) Harasim, L.M., 1989. *Online education: A new domain*. Educational Evaluation Centre, Ontario Institute for Studies in Education.
15) Harding, S., 1986. The instability of the analytical categories of feminist theory. *Signs: Journal of Women in Culture and Society*, *11*(4), pp.645-664.
16) Hill, C., Corbett, C. and St Rose, A., 2010. *Why so few? Women in science, technology, engineering, and mathematics*. American Association of University Women. 1111 Sixteenth Street NW, Washington, DC 20036.
17) Holland, D., and Lave, J. (2009). Social practice theory and the historical production of persons. *An International Journal of Human Activity Theory*, *2* , 1–15.
18) Holland, D. and Lave, J. 2009. Social practice theory and the historical production of persons. *An International Journal of Human Activity Theory*, *2*, 1–15.
19) Kearsley, G., 2000. Online education: Learning and teaching in cyberspace. *(No Title)*.
20) Kimani, G.N., Kara, A.M. and Njagi, L.W., 2013. Teacher factors influencing students' academic achievement in secondary schools in Nyandarua County, Kenya.
21) Lewis, L., 1999. *Distance education at postsecondary education institutions, 1997-98*. DIANE Publishing.
22) .Lynch, S.J., 2000. *Equity and science education reform*. Routledge.
23) Lyons, T., 2006. Different countries, same science classes: Students' experiences of school science in their own words. *International journal of science education*, *28*(6), pp.591-613.
24) Mozes-Carmel, A. and Gold, S.S., 2009. A Comparison of Online vs. Proctored Final Exams in Online Classes. *Journal of Educational Technology*, *6*(1), pp.76-81.
25) National Gender Policy., 2013. *National gender policy of Zimbabwe (2013–2017)*. Harare: Government Printers.
Office of Sustainable Development., 2000. November). Connected education. Retrieved December 4, 2023, from Washington State University, Knowledge Exchange and Learning Partnership Networks Web site: http://cbdd.wsu.edu/networks/KelpWebSite/connected/ce-definition.html
26) Owen, S., Dickson, D., Stanisstreet, M., and Boyes, E., 2008. Teaching physics: Students' attitudes towards different learning activities. *Research in Science and Technological Education*, *26*(2), 113-128.
27) Owusu-Fordjour, C., Koomson, C. K., and Hanson, D. 2020. The impact of Covid-19 on learning-the perspective of the Ghanaian student. *European journal of education studies*. http://dx.doi.org/10.46827/ejes.v0i0.3000
28) Paul, J. and Jefferson, F., 2019. A comparative analysis of student performance in an online vs. face-to-face environmental science course from 2009 to 2016. *Frontiers in Computer Science*, *1*, p.472525.
29) Paulsen, M.B. and John, E.P.S., 2002. Social class and college costs: Examining the financial nexus between college choice and persistence. *The Journal of Higher Education*, *73*(2), pp.189-236.
30) Price, L. (2006). Gender differences and similarities in online courses: Challenging stereotypical views of women. *Journal of Computer Assisted Learning*, *22*(5), 349-359.
31) Razami, H.H. and Ibrahim, R., 2021. Distance education during COVID-19 pandemic: The perceptions and preference of university students in Malaysia towards online learning. *International Journal of Advanced Computer Science and Applications*, *12*(4).
32) Sachdev, A.R., 2018. Gender disparity in STEM across cultures. *Industrial and Organizational Psychology*, *11*(2), pp.309-313.
33) Smeding, A., 2012. Women in science, technology, engineering, and mathematics (STEM): An investigation of their implicit gender stereotypes and stereotypes' connectedness to math performance. *Sex roles*, *67*, pp.617-629.
34) Smith, D.E., 1987. *The everyday world as problematic: A feminist sociology*. University of Toronto Press.
35) Thang, S.M. and Bidmeshki, L., 2010. Investigating the perceptions of UKM undergraduates towards an English for science and technology online course. *Computer Assisted Language Learning*, *23*(1), pp.1-20.
36) The ITU., 2021 Facts and Figures 2021: 2.9 billion people still offline, UN Agency for Digital Technologies, Accessed from https://www.itu.int/hub/2021/11/facts-and-figures-2021-2-9-billion-people-offline/ on 24/07/2024

37) UNICEF. 2019. *Every child learns.* UNICEF-education-strategy-2019-2030. United Nations Children's Funds. https://www.unicef.org/media/59856/file/UNICEF-education-strategy-2019-2030
38) UNICEF., 2000. *Educating girls, transforming the future?* New York, NY: United Nations.
39) UNICEF., 2012. *The state of the World's children 2012: Children in an urban world*. UNICEF-education-strategy-2019-2030. United Nations Children's Funds. https://www.unicef.org/reports/state-worlds-children-2012.
40) Volery, T. and Lord, D., 2000. Critical success factors in online education. *International journal of educational management*, *14*(5), pp.216-223.
41) West, M., Kraut, R. and Ei Chew, H., 2019. I'd blush if I could: closing gender divides in digital skills through education.
42) Xu, Y., 2015. Focusing on women in STEM: A longitudinal examination of gender-based earning gap of college graduates. The Journal of Higher Education, 86, 489-523. doi:10.1080/00221546.2015.11777373.