



Potential strategies to address gender disparities in the use of instructional tools for E-Learning in Higher Education Institutions

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ABSTRACT

The rapid growth of digital learning environments provides many new avenues for accessibility, flexibility, and innovation. However, despite the increased number of options available through digital learning environments, research continues to demonstrate that males and females are not benefiting equally from digital learning technologies. This study used an explanatory sequential mixed-methods approach to explore the potential strategies to address gender disparities in the use of instructional tools for E-learning in higher education institutions. It included both qualitative information obtained through in-depth interviews with 20 students (10 men and 10 women) at a South African University, and quantitative data collected using surveys administered to 358 undergraduate and graduate students. The research applied three theoretical frameworks: Social Cognitive Theory, the Technology Acceptance Model, and Constructivist Learning Theory. These theories guide the investigation into how individual factors (digital self-efficacy), technological factors (perceived usefulness and ease of use), and pedagogical social factors (instructional design) combine to influence the adoption of e-learning technology by men and women. Findings show how disparities exist between men and women in the use of e-learning technology. These are socially and institutionally constructed rather than biological. Therefore, it was recommended that the education community consider using more systemic and integrated strategies to address the issue of gender disparity in e-learning.

Keywords: E-Learning, Digital Equity, Gender Disparities, Higher Education, Inclusive Pedagogy

INTRODUCTION

Higher education institutions globally have been rapidly impacted by the proliferation of e-learning due to advancements in information and communication technologies and changes resulting from the COVID-19 pandemic. E-learning, through the utilization of digital instructional tools, has become a central component in the delivery of contemporary higher education.¹ In fact, it was estimated that at

¹ Violeta Milićević et al., "E-Learning Perspectives in Higher Education Institutions," *Technological Forecasting and Social Change* 166 (2021): 120618; Ugochukwu Okwudili Matthew, Jazuli Sanusi Kazaure, and Nwamaka U Okafor, "Contemporary Development in E-Learning Education, Cloud Computing Technology & Internet of Things.," *EAI Endorsed Trans. Cloud Syst.* 7, no. 20 (2021):

the height of the pandemic, over 220 million students were forced to transition to online learning.² Digital tools offer the opportunity to provide greater access to education, increase flexibility, and enhance learning outcomes. However, there is substantial evidence that the advantages offered by digital tools are not equally accessible to all. For example, the International Telecommunications Union reported that women in low and middle-income countries are approximately 19% less likely to utilize digital technologies than men, which will negatively impact their ability to participate in e-learning.³ Thus, the inequitable access to and the utilization of digital tools raise fundamental questions regarding equity in technology-mediated higher education.

Factors contributing to gender disparities in the utilization of digital instructional tools for e-learning are complex and interdependent. Initial studies of the digital divide focused on access to technology (computers and internet connection). However, current research identifies a wide array of additional inequalities, including digital skills, confidence, and patterns of usage. UNESCO reported that fewer than 30% of women globally possess basic digital skills compared to approximately 40% of men; the disparity widens in sub-Saharan Africa and South Asia.⁴ In higher education institutions, this disparity translates to women's reduced participation in online collaborative learning, reduced engagement with advanced digital instructional tools, and limited involvement in technology-driven academic innovation. This trend is especially concerning since women represent almost 50% of the global tertiary education student population; yet are significantly under-represented in technology-intensive learning spaces and decision-making bodies responsible for the adoption of educational technology.⁵ Therefore, the need exists to critically examine whether or not e-learning systems are capable of either mitigating or exacerbating existing gender inequality. Socio-cultural norms and gendered expectations play a significant role in determining how male and female students and academics interact with e-learning technologies.

In many societies located throughout the world, including those in the Global South, gender roles continue to shape educational experiences, confidence in utilizing technologies, and time allocated for academic work.⁶ Female students and faculty are disproportionately burdened with domestic responsibilities, lack institutional support, and experience implicit bias that positions technology as a masculine domain.⁷ These factors limit opportunities for developing skills, experimenting with, and engaging with instructional technologies on a continuous basis, which reinforces the existing inequalities found within digital learning environments.

Institutional characteristics of higher education systems also contribute to gender disparities in the utilization of instructional tools for e-learning.⁸ Digital platforms developed and implemented by higher education institutions frequently do not take into consideration the gendered learning needs, accessibility issues, and varied pedagogies of different types of learners. For example, some instructional tools emphasize competitive, individualized forms of interaction over collaborative and

e3; Schulz, Małgorzata. "E-learning as a development Tool." *Sustainability* 15.20 (2023): 15012; Małgorzata Schulz, "E-Learning as a Development Tool," *Sustainability* 15, no. 20 (October 18, 2023): 15012, <https://doi.org/10.3390/su152015012>..

² UNESCO, "COVID-19: Reopening and Reimagining Universities, Survey on Higher Education through the UNESCO National Commissions.," 2021.

³ ITU, "Bridging the Gender Divide.," 2021, <https://www.itu.int/en/mediacentre/backgrounders/Pages/bridging-the-gender-divide.aspx>.

⁴ UNESCO, *Global Education Monitoring Report: Migration, Displacement and Education – Building Bridges, Not Walls* (UNESCO, 2019), <https://doi.org/10.54676/XDZD4287>.

⁵ UNESCO, "The Representation of Women in Academia and Higher Education Management Positions: Policy Brief.," UNESCO-IIESALC policy brief series, 2023, <https://unesdoc.unesco.org/ark:/48223/pf0000386876>.

⁶ Nurul Aksar, "Exploring the Role of Media in Shaping Gender Perceptions in Education," *Breaking Barriers: Exploring Gender Dynamics In Education* 18 (2024); Ericson Alieto et al., "Teaching inside a Digital Classroom: A Quantitative Analysis of Attitude, Technological Competence and Access among Teachers across Subject Disciplines," *Heliyon* 10, no. 2 (2024); Amanda A Barrett et al., "The Impact of Gender Roles and Previous Exposure on Major Choice, Perceived Competence, and Belonging: A Qualitative Study of Students in Computer Science and Bioinformatics Classes," *Computer Science Education* 34, no. 1 (2024): 114–36.

⁷ UNESCO, "Global Guideline on Student Participation in Education Governance," 2019, <https://unesdoc.unesco.org/ark:/48223/pf0000367029>.

⁸ Fadi Abdelfattah et al., "Reviewing the Critical Challenges That Influence the Adoption of the E-Learning System in Higher Educational Institutions in the Era of the COVID-19 Pandemic," *Online Information Review* 47, no. 7 (2023): 1225–47; Nargis Hakimi et al., "Challenges and Opportunities of E-Learning for Women's Education in Developing Countries: Insights from Women Online University," *EDUTREND: Journal of Emerging Issues and Trends in Education* 1, no. 1 (2024): 57–69.

inclusive forms of interaction that the literature indicates are more supportive of a diversity of learners.⁹ Additionally, inadequate training programs, limited mentoring opportunities, and insufficient gender sensitive policies within institutions also create barriers to women effectively using e-learning technologies.¹⁰ Consequently, the promise of digital education as a means of creating an equitable environment is only partially fulfilled.

Gender disparities in the utilization of e-learning instructional tools have consequences that extend well beyond the individual experiences of students learning to affect educational and societal outcomes on a larger scale. When women are marginalized in digital learning environments, higher education institutions are at risk of perpetuating structural inequalities that limit women's academic success, career advancement, and participation in knowledge-based economies. This is of particular concern in an era in which digital competency is increasingly viewed as a determinant of employability, innovation, and leadership in the global workforce. Therefore, addressing the gender disparities in the utilization of instructional tools is both an educational imperative and a development and social justice issue in alignment with global goals such as the United Nations Sustainable Development Goals 5 on Gender Equality and Goal 4 on Inclusive and Equitable Quality Education.¹¹

The increasing recognition of the need for an intentional and evidence-based approach to increase gender equity through e-learning in higher education settings has led to the development of several potential approaches including the creation of equitable access to digital infrastructure, the integration of gender responsive pedagogical design, the enhancement of digital literacy and capacity building programs, and the establishment of inclusive institutional cultures that promote diversity and challenge stereotypes and bias. Literature is increasingly emphasizing the need for policy frameworks that integrate gender considerations into the educational technology planning process, along with participatory approaches to ensure that the voice of women are integrated into both the design and evaluation of e-learning systems.¹² These approaches emphasize the need to move beyond providing technical solutions and develop comprehensive or holistic strategies to address the structural, cultural, and pedagogical dimensions of inequalities associated with gender disparities in the use of e-learning instructional tools in higher education institutions.

This article will explore the various strategies available to reduce the gender disparity in the use of instructional tools in e-learning by higher education institutions. Through its discussion of the literature and the current debates surrounding digital inequality, gender and education, and technology-enhanced learning, the article will aim to advance our knowledge and understanding of the redesign of e-learning environments to support equity and inclusion in higher education institutions. In addition to exploring the broader literature and debates surrounding the use of instructional technology in higher education, the article focuses specifically on the higher education sector as it serves as a critical site for developing future professionals, educators, and policymakers. Therefore, ensuring that women and men have equal opportunities to utilize, access and benefit from instructional technologies is crucial for developing sustainable, innovative and socially responsible higher education systems. Finally, the article is significant, as it emphasizes the need for approaches that are contextualized to the specific region, institution and discipline in which they are being implemented as gender disparities in e-learning are not universal and what works well in one environment will likely require some form of modification when applied to another. Ultimately, the article provides a foundation for the development

⁹ Stanislav Kováč and Tatiana Slovákova, "Utilizing Collaborative Learning to Enhance Motivation, Foster Inclusivity and Support Well-Being in LSP," *Apps-Academic Journal of Applied Linguistics and Languages* 3, no. 1 (2025): 18–26.

¹⁰ Hakimi et al., "Challenges and Opportunities of E-Learning for Women's Education in Developing Countries: Insights from Women Online University"; Dimpho Kgakgamatso Oganetse and Dines Phiri, "Gender-Sensitive Literacy Policies in Distance Education: Overcoming Barriers to Women's Education in Sub-Saharan Africa," in *Literacy Policies for Equity and Inclusion* (IGI Global Scientific Publishing, 2025), 233–62.

¹¹ United Nations, "Goal 5: Achieve Gender Equality and Empower All Women and Girls," Sustainable Development Goals, 2015, <https://www.un.org/sustainabledevelopment/gender-equality/>.

¹² Elias Dritsas and Maria Trigka, "Methodological and Technological Advancements in E-Learning," *Information* 16, no. 1 (2025): 56; Asegul Hulus, "Review of Comprehensive Approaches for Encouraging Innovation and Inclusion in ETC Education to Foster Women's Engagement," *Discover Education* 4, no. 1 (2025): 123.

of policy, the implementation of institutional reforms, and the conduct of future research related to promoting gender equity in the use of e-learning instructional tools in higher education institutions.

LITERATURE REVIEW

Higher education has undergone a revolutionary transformation in the way teaching, learning, and assessment take place through the incorporation of e-learning technology across the world.¹³ Through the increasing availability of digital tools such as Learning Management Systems, Virtual Classrooms, Multimedia Content, Online Discussions, Simulations, and Platforms for Testing and Assessments, many educators believe that technology has provided access to learning, flexibility, and innovation in the delivery of education. However, while researchers recognize that technology has the opportunity to provide new pathways to learning, they also recognize that technology does not provide equally accessible opportunities to all learners. For example, Al-qdah et al. and Alkabaa noted that the differences in access to e-learning tools and confidence in using these tools, along with the effective use of these tools, differ significantly between men and women.¹⁴ These results raise questions about whether e-learning technology provides equal opportunities to all learners in higher education.

Using feminist and sociotechnical theory, researchers have determined that the disparities in e-learning tool usage between men and women are socially constructed and thus, not biologically constructed.¹⁵ Scholars identified that the design, implementation, and usage of technology are impacted by social norms, institutional cultures, and social and economic structures.¹⁶ Therefore, men and women will likely experience an e-learning environment differently due to their different socialized roles and societal expectations.¹⁷ Additionally, the social structure of higher education, including student socio-economic status, discipline-specific traditions, and institutional policies and practices, will influence the way in which men and women experience and utilize e-learning technologies.¹⁸

Most literature on the relationship between gender and e-learning usage focuses on the differential rates of technology adoption between men and women and the different levels of digital self-efficacy between men and women. According to Biney, digital self-efficacy is the extent to which a learner believes they can use digital technology effectively and efficiently.¹⁹ Researchers have also demonstrated that, while digital self-efficacy is a strong predictor of both learner engagement and

¹³ Santosh Kumar Yadav, "Redundant Publications," in *Research and Publication Ethics* (Springer, 2023), 95–107; Anushree Pandey, "E-Learning and Education 4.0: Revolution in Education of 21st Century," in *International Conference on Digital Technologies and Applications* (Springer, 2023), 431–38; Khalid Ilias Basheer Qolamani and Mohammad Mahdi Mohammed, "The Digital Revolution in Higher Education: Transforming Teaching and Learning," *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama* 15, no. 2 (2023): 837–46.

¹⁴ Majdi Al-qdah et al., "Gender Differences in E-Learning Tool Usage among University Faculty Members in Saudi Arabia Post-COVID-19," *COVID* 5, no. 5 (2025): 71; Abdulaziz S Alkabaa, "Effectiveness of Using E-Learning Systems during COVID-19 in Saudi Arabia: Experiences and Perceptions Analysis of Engineering Students," *Education and Information Technologies* 27, no. 8 (2022): 10625–45.

¹⁵ Firas Almasri, "The Impact of E-Learning, Gender-Groupings and Learning Pedagogies in Biology Undergraduate Female and Male Students' Attitudes and Achievement," *Education and Information Technologies* 27, no. 6 (2022): 8329–80; Dogus Darici et al., "Are Stereotypes in Decline? The Portrayal of Female Anatomy in E-learning," *Anatomical Sciences Education* 16, no. 4 (2023): 720–32; Ruth-Elizabeth Minga-Vallejo and María-Soledad Ramírez-Montoya, "Systematic Mapping of the Social Construction of Learning (2015-2020): Challenges for Online Learning Environments," *Online Learning* 26, no. 4 (2022): 449–74.

¹⁶ Akmal Akmal et al., "Examining the Effects of Technology Adoption, Cultural Values, Social Capital, and Government Policies on Entrepreneurial Success and Social Impact in Indonesia," *International Journal of Business, Law, and Education* 5, no. 1 (2024): 431–49; Md Mehedi Hasan Emon and Tahsina Khan, "The Impact of Cultural Norms on Sustainable Entrepreneurship Practices in SMEs of Bangladesh," *Indonesian Journal of Innovation and Applied Sciences (IJIAS)* 3, no. 3 (October 30, 2023): 201–9, <https://doi.org/10.47540/ijias.v3i3.962>; Fioramonti, Lorenzo, Luca Coscieme, Robert Costanza, Ida Kubiszewski, Katherine Trebeck, Stewart Wallis, Debra Roberts et al. "Wellbeing economy: An effective paradigm to mainstream post-growth policies?." *Ecological Economics* 192 (2022): 107261; Lorenzo Fioramonti et al., "Wellbeing Economy: An Effective Paradigm to Mainstream Post-Growth Policies?," *Ecological Economics* 192 (February 2022): 107261, <https://doi.org/10.1016/j.ecolecon.2021.107261>.

¹⁷ Maria Ong et al., "Inside the Double Bind: A Synthesis of Empirical Research on Undergraduate and Graduate Women of Color in Science, Technology, Engineering, and Mathematics," *Harvard Educational Review* 81, no. 2 (June 1, 2011): 172–209, <https://doi.org/10.17763/haer.81.2.t022245n7x4752v2>.

¹⁸ Ibrahim Bani Bakkar and Azidah Abu Ziden, "Analysis of Perceptions and Insights of E-Learning Implementation in Educational Institutions by Educators, Students, and Parents," *International Journal of Academic Research in Progressive Education and Development* 12, no. 4 (December 24, 2023), <https://doi.org/10.6007/IJARPED/v12-i4/20191>.

¹⁹ Patrick Biney Amissah, "Digital Literacy Skills as a Determinant of Teacher's Preparedness to Use the 2019 Curriculum: A Case of Basic School Teachers in Cape Coast Metropolis" (University of Cape Coast, 2023).

learner success in digital learning environments;²⁰ Qazi et al., and Christensen argued that generally, males report having more confidence in their ability to use instructional technology than females, despite females having demonstrated equivalent proficiency with the same tools.²¹ The disparity in digital self-efficacy is attributed to early socialization processes, gendered stereotypes of technology being masculine, and unequal access to advanced digital tools.²² Therefore, disparities in digital self-efficacy can result in disparate levels of engagement, participation, and sustained use of e-learning tools.

While the disparity in digital self-efficacy has been extensively documented, recent research indicates that disparities in digital self-efficacy between men and women are not fixed or inevitable. Rather, institutional supports and inclusive pedagogies have been demonstrated to reduce disparities in confidence and usage of e-learning tools. Findings from a study conducted by Li demonstrate that structural guidance, timely feedback, and opportunities for low-risk experimentation can significantly reduce the gender gap in technology-related engagement.²³ This shift in focus from individual deficits to institutional responsibilities emphasizes the need for developing e-learning environments that promote confidence and competency among all learners.

In addition to the challenges associated with self-efficacy, there is the challenge of access and institutional support. While many higher education institutions assume that students have access to digital devices and the internet, empirical research has demonstrated that access to digital devices and reliable internet connectivity continue to be unequally distributed, particularly in resource-poor contexts.²⁴ Access to personal devices, stable internet connections, and suitable learning spaces may prevent the participation of female students, who are more likely to have multiple domestic or caregiving responsibilities. Studies have demonstrated that providing ongoing technical support, responsive help systems, and open institutional communication are essential in removing barriers to equitable participation in e-learning environments.²⁵

Constructivist Theory and Experiential Learning Theory emphasize that students learn differently and possess unique cognitive and learning styles.²⁶ E-learning environments that limit themselves to a few instructional formats risk creating an advantage for one type of learning style over others. Therefore, creating an inclusive e-learning environment through utilizing a variety of multimedia formats, asynchronous and synchronous activities, interactive simulations, and a range of

²⁰ Ying Zhang, "Impact of Digital Literacy on College Students' English Proficiency: The Mediating Role of Learning Motivation and the Moderating Effect of Technological Self-Efficacy," *Acta Psychologica* 259 (2025): 105452; Seyum Getenet et al., "Students' Digital Technology Attitude, Literacy and Self-Efficacy and Their Effect on Online Learning Engagement," *International Journal of Educational Technology in Higher Education* 21, no. 1 (2024): 3; Shoeb Saleh and Rommel AlAli, "Digital Learning Tools (Institutional-Open) and Their Relationship to Educational Self-Effectiveness and Achievement in Online Learning Environments," *Przestrzeń Społeczna (Social Space)* 22, no. 3 (2022): 226–56.

²¹ Atika Qazi et al., "Gender Differences in Information and Communication Technology Use & Skills: A Systematic Review and Meta-Analysis," *Education and Information Technologies* 27, no. 3 (2022): 4225–58; MacKenzie A Christensen, "Tracing the Gender Confidence Gap in Computing: A Cross-National Meta-Analysis of Gender Differences in Self-Assessed Technological Ability," *Social Science Research* 111 (2023): 102853.

²² Saleh and AlAli, "Digital Learning Tools (Institutional-Open) and Their Relationship to Educational Self-Effectiveness and Achievement in Online Learning Environments."

²³ Mao Li, "Exploring the Digital Divide in Primary Education: A Comparative Study of Urban and Rural Mathematics Teachers' TPACK and Attitudes towards Technology Integration in Post-Pandemic China," *Education and Information Technologies* 30, no. 2 (February 12, 2025): 1913–45, <https://doi.org/10.1007/s10639-024-12890-x>.

²⁴ Neil Selwyn, "Ed-Tech Within Limits: Anticipating Educational Technology in Times of Environmental Crisis," *E-Learning and Digital Media* 18, no. 5 (2021): 496–510; Ong, Maria, Carol Wright, Lorelle Espinosa, and Gary Orfield. "Inside the double bind: A synthesis of empirical research on undergraduate and graduate women of color in science, technology, engineering, and mathematics." *Harvard educational review* 81, no. 2 (2011): 172-209; Li, Mao. "Exploring the digital divide in primary education: A comparative study of urban and rural mathematics teachers' TPACK and attitudes towards technology integration in post-pandemic China." *Education and Information Technologies* 30, no. 2 (2025): 1913-1945.

²⁵ Idowu Sulaimon Adeniyi et al., "E-Learning Platforms in Higher Education: A Comparative Review of the USA and Africa," *International Journal of Science and Research Archive* 11, no. 1 (2024): 1686–97; Taha Abuali and Abdussalam Ali Ahmed, "Challenges and Opportunities in Implementing E-Learning in Developing Countries," *The Open European Journal of Social Science and Education (OEJSSE)*, 2025, 1–12.

²⁶ D. A. Kolb, *Experiential Learning: Experience as the Source of Learning and Development* (Englewood Cliffs, NJ: Prentice-Hall, 1984).

assessment formats can create opportunities for equal gender-based engagement and prevent creating or increasing already existing gender-based disparities.²⁷

Collaborative learning and social interaction in e-learning environments also require attention to instructional design. Garrison Community of Inquiry model states that social presence is a crucial component of successful online learning.²⁸ Collaborative e-learning tools, including group discussions, project assignments, and peer feedback systems, can allow for student support and collaborative knowledge building. When collaborative activities are structured to encourage inclusive and shared responsibility, research indicates that this structure can reduce the gender gap.²⁹ Nevertheless, Qazi et al. noted that if these collaborative learning settings are not intentionally facilitated, they can continue previous gender-based patterns of participation, further emphasizing the necessity for deliberate design and facilitation of collaborative learning settings.³⁰

Other suggestions found in the literature included promoting digital literacy and developing capacity. Digital literacy encompasses technical competency and the ability to think critically about information, communicate effectively, and ethically interact with digital content.³¹ Research shows that students who receive regular, context-specific training develop greater confidence in their ability to use e-learning tools and demonstrate deeper engagement. However, Laurillard notes that "workshops" as singular events may not result in high levels of learning and therefore may not be effective unless they are embedded in course activity and learning goals.³² Gender-sensitive training methods that take into consideration varying baseline experiences and rates of learning have been proven to be effective in reducing existing inequalities.

In recent years, there has been an increase in interest in gamification and interactive learning platforms as a means of improving learner engagement in e-learning. An important aspect of gamification is the incorporation of elements similar to games into instructional design, including points, badges, challenges, and feedback.³³ Gamification has been found to assist in decreasing learner anxiety and enhancing sustained participation. Previous research indicated that gamification was primarily appealing to male learners; however, scholars indicate that more recent research has found that by incorporating design elements that focus on mastery, collaboration, and providing meaningful feedback, learners of all genders can be attracted.³⁴ The authors' findings support the broader conclusion that design choices, rather than inherent gender preferences, influence learner engagement.

Overall, the literature provides evidence that gender differences in the use of instructional technologies to support e-learning are influenced by an interconnected array of factors, including self-efficacy, availability of resources, instructional design, social interaction, and institutional support.

The purpose of the current study is to address some of the identified gaps by empirically testing a number of strategies to reduce gender disparities in the use of instructional technologies to support e-learning in higher education institutions. By connecting the practices of institutions with empirical research-based, inclusive design principles, the current study contributes to the body of research intended to promote equity, access, and effectiveness in digital learning environments.

²⁷ Diana Laurillard, "Trust the Teachers: A Collaborative Approach to Learning Design Solutions," in *Envisioning the Future of Education through Design* (Springer, 2024), 119–45.

²⁸ D Randy Garrison, "A Brief History of the Community of Inquiry Framework (a Personal Recollection)," in *The Design of Digital Learning Environments* (Routledge, 2024), 26–43.

²⁹ Stefan Hrastinski, "Fiction as a Method to Imagine Higher Education Futures," *Higher Education Research & Development* 44, no. 1 (2025): 1–7.

³⁰ Qazi et al., "Gender Differences in Information and Communication Technology Use & Skills: A Systematic Review and Meta-Analysis."

³¹ Akmal et al., "Examining the Effects of Technology Adoption, Cultural Values, Social Capital, and Government Policies on Entrepreneurial Success and Social Impact in Indonesia"; Choi-Meng Leong et al., "E-Learning Satisfaction: Investigating Gender Differences," *International Journal of Electronic Commerce Studies* 12, no. 1 (2021): 1–27; Amissah, "Digital Literacy Skills as a Determinant of Teacher's Preparedness to Use the 2019 Curriculum: A Case of Basic School Teachers in Cape Coast Metropolis."

³² Laurillard, "Trust the Teachers: A Collaborative Approach to Learning Design Solutions."

³³ Christo Dichev, Darina Dicheva, and Rita Ismailova, "Motivators Matter When Gamifying Learning Activities," in *International Conference on Interactive Collaborative Learning* (Springer, 2022), 947–58.

³⁴ Olga Gradinaru, "Gamification Practice for Online Teaching and Learning," *Lingua. Language and Culture* 20, no. 1 (2021): 63–68; Garrison, "A Brief History of the Community of Inquiry Framework (a Personal Recollection)"; Yadav, "Redundant Publications."

THEORETICAL FRAMEWORK

This study utilizes an integrated theoretical framework consisting primarily of Social Cognitive Theory, the Technology Acceptance Model, and Constructivist Learning Theory to explain why gender disparities exist in the utilization of e-learning instructional tools for students enrolled in higher education institutions. Together, these theories provide a suitable framework to identify how individuals' perspectives on instructional technology, the social environment in which they learn, and the instructional design of instructional tools interact to influence student participation in e-learning activities.

According to Bandura, Social Cognitive Theory explains how self-efficacy, observational learning, and reciprocal causation affect human behavior.³⁵ For example, students' confidence in the ability to utilize instructional tools to aid in learning directly influences whether students will choose to continue exploring different digital technologies. As a result, the difference in the utilization of e-learning instructional tools between males and females can be attributed, in part, to the difference in digital self-efficacy experienced by students due to past experiences, socialization, and instructor/peer feedback. For instance, female students may have been given fewer opportunities to use technology, and/or socialized to believe that technology was male-oriented; thus, these students may initially feel less confident when using certain tools. However, according to Social Cognitive Theory, the difference in digital self-efficacy may be reduced by giving students experience with mastering new technologies, exposure to models who exhibit positive attitudes towards technology, and positive reinforcement such as role models, guides, and positive feedback regarding their performance on digital assignments within the e-learning platform.

In addition, the Technology Acceptance Model (TAM) provides further insight into how students' beliefs about technology influence their adoption and use of technology.³⁶ TAM indicates that perceived usefulness and perceived ease of use are the most important factors influencing an individual's intention to use a particular technology. For example, if students perceive the instructional tools used for e-learning as difficult to use, not relevant to the material they are studying, and/or not aligned with the needs of the students, then it is plausible that there will be gender disparities in the utilization of those tools. This model also emphasizes the need for designers of instructional tools to design tools that are easy to use, flexible, and aligned with the goals of the course. Designers of instructional tools can enhance perceived ease of use by using such strategies as providing clear tutorials, providing continuous technical assistance, and developing games for the user interface. Designers of instructional tools can enhance the perceived usefulness of e-learning instructional tools for both genders by developing courses that include all students and assess students based on what is relevant to them.

The Constructivist Learning Theory also validates this framework based on the learning being an activity-centered learner-centered, and how learners construct knowledge from experience. According to Garrison & Vaughan and Jullien & Kolb, learning occurs best when learners can engage the content, learners, and instructors in a manner that makes sense to them.³⁷ Thus, e-learning instructional tools designed to facilitate learner interaction, create opportunities for learners to reflect on their learning, and enable learners to follow multiple paths toward learning will allow for the diverse learning styles of learners and diminish any gender-based variations in learner participation within the learning process. Additionally, this conceptualization of learning underscores the positive effects of student collaboration, shared experiences, and use of interactive tools to achieve equitable levels of learner involvement in the learning process.

Together, the three theoretical models have created a complete model explaining gender-based disparities in e-learning through the relationships between the individual's perceptions of the

³⁵ Albert Bandura, *Self-Efficacy in Changing Societies* (Cambridge university press, 1997).

³⁶ Viswanath Venkatesh and Michael G Morris, "Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior1," *MIS Quarterly* 24, no. 1 (2000): 115–39.

³⁷ D. Randy Garrison and Norman D .Vaughan, *Blended Learning in Higher Education: Framework, Principles, and Guidelines* (John Wiley & Sons, 2008); REMI Jullien and M Kolb, "Hierarchical Model for Chemically Limited Cluster-Cluster Aggregation," *Journal of Physics A: Mathematical and General* 17, no. 12 (1984): L639–43.

instructional tool(s), the design of the tool(s) itself, and the learning environment in which the tool(s) are used. The Social Cognitive Theory defines the relationship between a learner's perception of their ability to utilize the tool(s) and their desire to participate in e-learning. The TAM defines the learner's perceptions of the tool(s) and their desire to utilize the tool(s). Finally, the Constructivist Learning Theory defines the relationship between the learning environment and the learner's utilization of the tool(s). As such, collectively, these models serve as a base for developing studies focused upon eliminating gender-based variations in the utilization of instructional tool(s) for e-learning in post-secondary educational environments.

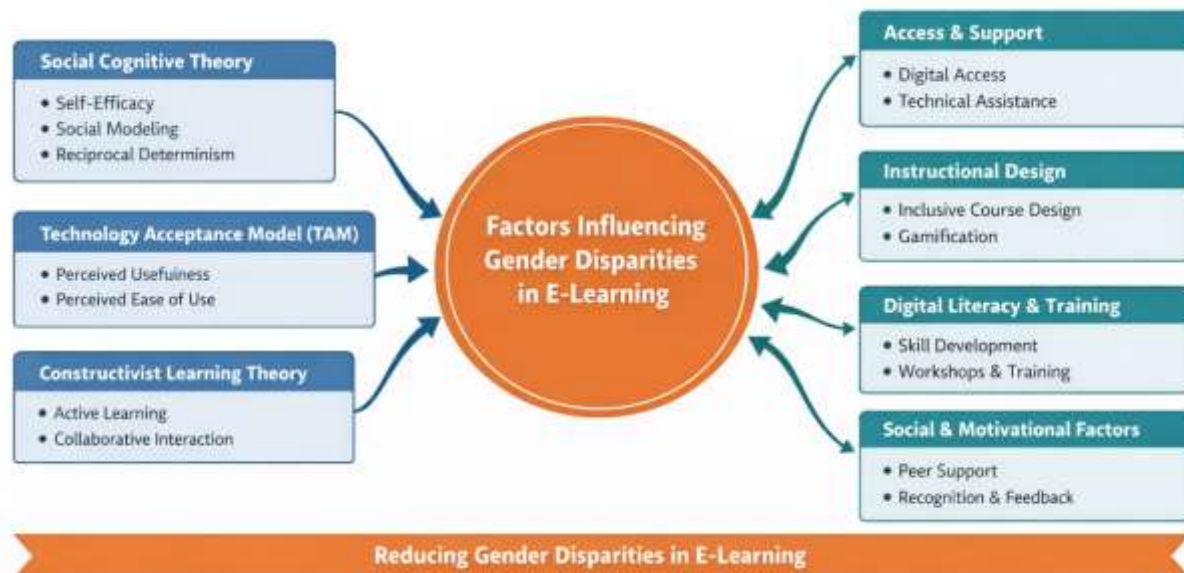


Figure 1: Model developed by Owolabi, Garutsa & Maunatlala

The combination of the three factors illustrated in the conceptual model will result in the reduction of inequity in e-learning. By creating a holistic program that implements evidence-based practice for the development of digital literacy, designing programs with a variety of teaching approaches, incorporating activities such as game playing into instructional activities, providing technical support, recognizing achievement, and other strategies, educational institutions can provide environments in which all students will have the opportunity to feel confident and have equal access to the instructional tools for e-learners.

METHODOLOGY

The study made use of an explanatory sequential mixed-methods approach to examine gender differences in e-learning within the South African higher education sector, utilizing instructional technology. Components of both qualitative and quantitative research methodologies were utilized to strengthen the study.³⁸ In order to ensure the reliability of the data, the study utilized a combination of survey questionnaires and in-depth interviews. Interviews were included in the explanatory design to explore gender differences in the utilization of instructional technology for e-learning at South African universities. A survey questionnaire was used by the researcher to interview both male and female students. Due to the fact that this type of sample is representative, the researcher was able to generalize the study's findings at this time.

Using a Raosoft calculator, <http://www.raosoft.com/samplesize.html>, the researcher calculated the sample size. The total student enrollment at the Mahikeng Campus of North-West University for the 2024/25 academic year, consisting of 9,321 undergraduate and 3,033 postgraduate students, was estimated to be approximately 12,354 students.³⁹ Based on 56 students per academic school at the university, the sample size was determined to be 358 students (179 females and 179 males). The sample

³⁸ John W Creswell and Vicki L Plano Clark, *Designing and Conducting Mixed Methods Research* (Sage publications, 2017).

³⁹ North-West University, "Quick Stats 2023/2024." (North-West University, , 2023).

size is large enough to adequately represent the population of students enrolled at South African universities. Using two sampling techniques, 24 students (10 female and 10 male), and six lecturers provided detailed information about factors affecting their preferences and utilization of e-learning resources. For instance, the researcher specifically chose the volunteers who were interviewed as part of the in-depth interviews in Phase 2 as examples of individuals with extensive knowledge of the topic area and therefore the focus of purposeful sampling.⁴⁰ Snowball sampling was also used as part of the study. As an additional means of verifying the results obtained from the survey questions, the researchers conducted interviews in Phase 2.

A mixed-methods methodology was used to analyze the data in the study. One benefit of using the mixed-methodology is that it allows for the use of both simple quantitative descriptions and a more detailed investigation of the quantitative results.⁴¹

Content analysis was also used by the researcher to provide structure, organization, and significance to the vast amounts of qualitative data collected during the study. Qualitative data analysis transforms data into study conclusions and claims.⁴² The data collected through the survey questionnaire were analyzed using the SPSS statistical software. Hypothesis testing was performed using the Chi-Square test and basic descriptive statistics to determine if a statistically significant difference exists in the distribution of e-learning tool options between male and female students. The following are the ethical criteria that the study adhered to: maintaining participant anonymity, obtaining informed consent, assuring honesty, protecting confidentiality, ensuring responsible publishing, minimizing risk, and thus maximizing benefits. Because this study consisted of human participants, ethics approval was received from the Basic and Social Sciences Research Ethics Committee (BaSSREC) of the North-West University Senate Committee for Research Ethics on the 7th of March, 2024, with ethics number – NWU-00660-21-A7-01.

PRESENTATION OF FINDINGS AND DISCUSSION

Table 1: Socio-demographic characteristics of respondents

Gender	Frequency	Percentage
Male	179	50.0
Female	179	50.0
Total	358	100.0
Age	Frequency	Percentage
18-25	120	33.48
26-30	90	25.14
31-40	85	23.74
40 and Above	63	17.61
Total	358	100.0
School	Frequency	Percentage
Social Sciences	32	8.95
Communication	55	15.37
Government Studies	65	18.16
Music	72	20.11
Philosophy	75	20.91
Languages	59	16.49
Total	358	100.0
Year of Study	Frequency	Percentage
Undergraduate	150	41.91

⁴⁰ Alan Bryman, *Social Research Methods* (Oxford university press, 2016).

⁴¹ Janice M. Morse, *Mixed Method Design: Principles and Procedures* (Routledge, 2016).

⁴² John W. Creswell and Abbas Tashakkori, "Editorial: Differing Perspectives on Mixed Methods Research," *Journal of Mixed Methods Research* 1, no. 4 (October 1, 2007): 303–8, <https://doi.org/10.1177/1558689807306132>.

Honours	90	25.14
Masters	75	20.91
PhD	43	12.00
Total	358	100.0

An analysis of demographics for 358 people was conducted on gender, age, area of study, and year in study. The data collected show a perfect balance regarding gender; there were an equal number of males and females (179) in the sample. Gender is evenly represented in this sample. Regarding age, the largest group of participants reported being between the ages of 18 and 25 (33.48%). Participants who reported being between the ages of 26 and 30 made up the second largest group (25.14%), the third largest group reported being between the ages of 31 and 40 (23.74%), and the smallest group reported being 40 or older (17.61%). These numbers show that the participants sampled represent a large number of younger people, which would be expected in an educational setting.

Participants were surveyed from six different areas of study, and had the greatest interest in either Philosophy (20.91%) or Music (20.11%). They were also interested in Government Studies (18.16%) and Languages (16.49%). Participants showed the least amount of interest in Communication (15.37%) and Social Sciences (8.95%). This distribution of interests clearly shows that participants were much more likely to be interested in studying the humanities and the arts than other subjects.

In regards to the year they were in school, the greatest number of participants were undergraduate students (41.91%), then came the number of Honours students (25.14%), followed by the number of Master's students (20.91%), and finally the number of PhD candidates (12.00%). This distribution clearly shows that the majority of participants were at a foundation or intermediate level in their studies, rather than at an advanced postgraduate level.

When looking at the overall results, it can be seen that the data collected represents the population as being evenly divided in regard to gender, and that the participants were all relatively young, as well as representing a wide variety of academic areas of study, but with a greater representation of humanities and arts-related studies. Overall, the data collected show a strong representation of undergraduate studies and may provide information that can assist in planning targeted initiatives in education and developing programs for future students.

Table 2: Strategies to bridge Gendered Differences in e-learning tools.

Statement	Scale	Frequency	Percentage
Offering a diverse range of e-learning instructional tools can help address gender differences in tool usage.	Strongly Disagree	10	2.79
	Disagree	20	5.59
	Neutral	60	16.76
	Agree	140	39.11
	Strongly Agree	128	35.75
Total		358	100.0
Providing clear instructions and tutorials for using instructional tools can help reduce gender disparities in tool adoption.	Strongly Disagree	12	3.35
	Disagree	18	5.03
	Neutral	65	18.16
	Agree	130	36.31
	Strongly Agree	133	37.15
Total		358	100.0
Engaging in open discussions about the benefits of instructional tools and their relevance to different genders can promote more equitable usage.	Strongly Disagree	15	4.19
	Disagree	28	7.82
	Neutral	80	22.35
	Agree	140	39.11
	Strongly Agree	95	26.54

Total		358	100.0
Creating collaborative group activities that encourage both male and female students to work together using instructional tools can mitigate gender differences.	Strongly Disagree	8	2.23
	Disagree	22	6.15
	Neutral	75	20.95
	Agree	140	39.11
	Strongly Agree	113	31.56
Total		358	100.0
Implementing regular assessments that incorporate instructional tools can encourage equal participation and skill development among all genders.	Strongly Disagree	10	2.79
	Disagree	30	8.38
	Neutral	70	19.55
	Agree	130	36.31
	Strongly Agree	118	32.96
Total		358	100.0
Designing courses that accommodate various learning styles and preferences, including the use of different instructional tools, can enhance equitable usage among male and female students.	Strongly Disagree	12	3.35
	Disagree	20	5.59
	Neutral	80	22.35
	Agree	140	39.11
	Strongly Agree	106	29.61
Total		358	100.0
Organizing workshops or training sessions specifically focused on enhancing e-learning tool proficiency can contribute to reducing gender disparities.	Strongly Disagree	14	3.91
	Disagree	24	6.70
	Neutral	78	21.79
	Agree	128	35.75
	Strongly Agree	114	31.84
Total		358	100.0
Encouraging male and female students to share their experiences and success stories with using instructional tools can inspire others to utilize them.	Strongly Disagree	10	2.79
	Disagree	18	5.03
	Neutral	70	19.55
	Agree	135	37.71
	Strongly Agree	125	34.91
Total		358	100.0
Providing ongoing technical support and assistance for using instructional tools can help create a more inclusive e-learning environment.	Strongly Disagree	8	2.23
	Disagree	25	6.98
	Neutral	75	20.95
	Agree	140	39.11
	Strongly Agree	110	30.73
Total		358	100.0
Integrating gamification or interactive elements into instructional tools can attract a wider range of students, regardless of gender.	Strongly Disagree	12	3.35
	Disagree	20	5.59
	Neutral	70	19.55
	Agree	140	39.11
	Strongly Agree	116	32.40
Total		358	100.0

Recognizing and showcasing outstanding projects or assignments completed using instructional tools can motivate both male and female students.	Strongly Disagree	15	4.19
	Disagree	30	8.38
	Neutral	60	16.76
	Agree	130	36.31
	Strongly Agree	123	34.36
Total		358	100.0

Gender disparities in the use of e-learning tools can be addressed through a variety of methods, as evidenced by data collected from 358 respondents in the study above. The respondents' answers to questions regarding the different methods used to address the gender disparity were scored on a Likert scale, which ranged from "Strongly Disagree" to "Strongly Agree". The scores provide insight into the level of agreement the respondents had regarding the effectiveness of each method used to reduce the disparity between men and women in terms of utilizing e-learning technology.

The most popular strategy for creating a more equal utilization rate of e-learning tools was making available a wide variety of e-learning tools (74.86%), followed closely by giving detailed step-by-step instructions on how to utilize the tools provided (73.46%). Both of these strategies have been deemed essential in reducing the disparity between men and women regarding e-learning technology, because they allow for varying user preferences and provide assurance that all users will be able to successfully operate the tools.

Creating collaborative groups of students to work together and having an open discussion about the importance and relevance of instructional tools were other highly rated strategies. Of the respondents, 70.67% agreed or strongly agreed that the collaborative group format would help increase equality, while 65.65% believed that an open discussion would do the same. These two formats promote inclusion by allowing students to work together as a team and educating them about the benefits of equally sharing and utilizing instructional tools.

Regular assessment of students using instructional tools (69.27%), and developing course materials tailored to individual learning preferences (68.72%) were also identified as successful strategies in reducing gender disparities in the use of e-learning tools. Both of these strategies promote equal opportunity and ensure that all students have access to and can benefit from e-learning tools.

While providing workshops or training sessions to educate students on how to better utilize e-learning tools (67.59%), and encouraging students to share their experiences and success stories with others (72.62%), were identified as being successful in increasing the number of students who utilize e-learning tools, both strategies have additional benefits as well. They help to increase the confidence and competence of students in utilizing e-learning tools, and this increased confidence inspires more students to adopt the tools.

Finally, the results of the study show that many respondents believe that providing continuous technical support (69.84%) and incorporating gaming or interactive elements into the instructional tools (71.51%) were also successful strategies in reducing gender disparities in the use of e-learning tools. The former reduces the barrier of technology for students, while the latter appeals to the diverse preferences of students and makes e-learning more enjoyable.

Additionally, 70.67% of the respondents found it important to recognize and showcase outstanding project examples created using e-learning tools. This type of recognition is seen as a motivator to equally utilize instructional tools by demonstrating achievements across genders.

Overall, the results of the study indicate that there is a high degree of consensus among respondents concerning the effectiveness of the strategies that promote inclusiveness, engagement, and accessibility in e-learning environments. There was very little disagreement among respondents concerning any of the strategies (typically less than 13%), indicating that the vast majority of respondents agree that these types of approaches should be implemented to reduce gender disparities in the use of e-learning tools. To bridge the gap between men and women in e-learning requires a

combination of various strategies. These include using a wide variety of e-learning tools, providing clear instructions and tutorials, creating collaborative group activities, designing courses to accommodate different learning styles, providing workshops/training sessions, providing gamification/interactive elements, and providing continuous technical support, in addition to recognizing and celebrating the achievement of students who complete outstanding projects using e-learning tools. All of these strategies create a more inclusive and effective e-learning environment for all learners.

Test of Hypothesis

The focus of the study was on the following Research Hypothesis: No significant interventions exist to bridge the gendered differences in the use of instructional tools for e-learning in Institutions of Higher Learning (H₀), Significant Interventions exist to Bridge Gendered Differences in the Use of Instructional Tools for e-Learning in Institutions of Higher Learning (H₁).

Table 3: Test of Hypothesis

Statement	F-value	p-value	Significant Difference (p < 0.05)
Offering a diverse range of e-learning instructional tools	4.23	0.042	Yes
Providing clear instructions and tutorials	2.15	0.143	No
Engaging in open discussions	6.08	0.0143	Yes
Creating collaborative group activities	3.32	0.072	No
Implementing regular assessments	5.87	0.016	Yes
Designing courses to accommodate various learning styles	7.45	0.007	Yes
Organizing workshops or training sessions	2.89	0.091	No
Encouraging sharing of experiences and success stories	6.91	0.009	Yes
Providing ongoing technical support	4.56	0.035	Yes
Integrating gamification or interactive elements	3.98	0.048	Yes
Recognizing outstanding projects	1.85	0.176	No

This data is utilized to test the hypothesis about gender differences in the instructional technology used for e-learning in the institutions of higher education. More specifically, this data explores whether particular interventions can provide effective ways to address the gender difference gap in the use of e-learning tools. The hypotheses contain both a null (H₀) and an alternative (H₁) hypothesis. The null hypothesis states that no effective interventions currently exist to address the gender difference gap in e-learning tool usage, while the alternative hypothesis proposes that there are many effective interventions available to help bridge the gender difference gap in e-learning tool usage.

According to the results, several interventions were determined to be successful in reducing gender disparities in e-learning. Interventions that had a statistically significant effect in reducing gender disparities in e-learning (identified through p-value < .05) included providing students access to a wide variety of e-learning tools (F = 4.23; p = .042); facilitating open discussion among students (F = 6.08; p = .0143); administering regular assessments to measure student performance (F = 5.87; p = .016); developing courses that can cater to different types of learning (F = 7.45; p = .007); promoting peer-to-peer interaction through experience sharing and success stories (F = 6.91; p = .009); ensuring continuous technical assistance to students (F = 4.56; p = .035); and including game-based or interactive features in their e-learning platforms (F = 3.98; p = .048). These interventions clearly demonstrate strong potential in bridging the gender gap in e-learning.

On the other hand, there were some non-significant interventions, with p values greater than .05. These interventions included providing students with detailed instructions and/or tutorial information (F = 2.15; p = .143); creating collaborative group activities for students (F = 3.32; p = .072); hosting workshops/training sessions for students (F = 2.89; p = .091); and awarding recognition

to outstanding projects completed by students ($F = 1.85$; $p = .176$). Therefore, the results indicate that such interventions do not have a strong positive impact on reducing gender disparities in e-learning.

Therefore, the data suggests that targeting specific strategies such as using multiple types of e-learning tools, incorporating games into the design of their platform, and using inclusive design methods when building their online courses would likely have the greatest positive impact in terms of decreasing gender disparities in e-learning. In addition, the data also indicates the need to revisit those interventions that were ineffective in order to determine if they could be improved upon or replaced.

Finally, the results of the data analysis were consistent with the insights gained from conducting the interviews. Thus, the data analysis supports the views expressed during the interviews regarding the importance of utilizing targeted intervention strategies in order to decrease gender disparities in e-learning within institutions of higher education. As was stated in the previous paragraph, the data analysis indicated that successful interventions to decrease gender disparities in e-learning include using multiple e-learning tools, encouraging students to share their experiences, and using inclusive designs in the development of the online courses. This is consistent with the views of the interview participants who expressed the belief that increasing inclusiveness, improving accessibility, and tailoring interventions to meet individual needs are essential in decreasing gender disparities in e-learning.

Inclusivity and Equal Accessibility

Some participants noted that to be able to have an even playing field, all people must have an equal chance to use tools and to get the same amount of resources as well. The study found that providing continuous technical assistance ($F = 4.56$, $P = .035$) and integrating game design ($F = 3.98$, $P = .048$) are both considered significant interventions. Participants stated the following:

“All students should have access to tools, regardless of their gender, and there should be a gender sensitive curriculum developed so that it is inclusive of all students.” (**Third-year student, 22 years old, female; Arts in Communications.**)

“Teachers should create an environment where they provide all students with equal opportunities and access to instructional materials, because in South Africa we believe in the idea of equality.” (**First-Year Student, 18 years old; Female; Public Governance and Administration.**)

Promoting Digital Literacy and Training Programs

The statistical support for intervention-based strategies such as sharing experience ($F=6.91$, $p=0.009$) and providing diverse tools ($F=4.23$, $p=0.042$) also applies to the proposal to improve digital literacy and offer training. In this context, we see statements from students as follows:

“Digital literacy should be promoted by schools/institutions; regardless of gender, there should be programs/initiatives to teach digital literacy and other relevant digital skills.” (**Male, 20 years old, Communication student, Third year**)

“The university could do simulation-based training, train both males/females with a separate area on the site for them to access the training on their own schedule, in addition to course-related training.” (**Female, 27 years old, Psychology student, Third year**)

Designing Tools to Cater to Diverse Learning Styles

The findings based on statistics from the study that course design may help students learn by addressing different learning types ($F=7.45$, $p=0.007$), reflect what some of the participants said during their interviews:

“An appropriate tool needs to address both learning preferences as well as gender differences (men/women); the tool will serve as an intermediary for each gender’s preference.” (**Sociology Major – Female; Age – 25 years; Extra Year.**)

Engaging Wellness and Support Initiatives

In line with the statistically significant level of open discussion ($F=6.08, p=0.0143$), as well as that of offering ongoing technical support, an interviewee stated that we can "equalize" rather than "neutralize," this by developing wellness programs and conducting surveys to spread awareness (**Male, 21, Developmental Studies, second year**).

Technical Challenges and the Role of Educators

Consistency in e-learning environments is shown to be an issue by both the statistics from the study and interviews. Although no significant relationship was identified between organizing workshops and instructor preparedness ($F=2.89, p=.091$), interview participants emphasized that technical issues and instructor preparedness are critical factors:

"Students should be checked by instructors for all their activity on eFundi, and if students appear inactive, follow up. In fact, sometimes even instructors will have difficulty uploading slides into the course content platform, so this can significantly affect how students learn" (**Female, 27 years old, Psychology, Third Year**)

Both the quantitative and qualitative research support the need for an inclusive e-learning design that bridges gender-based differences. This can be achieved through using many different types of tools, teaching digital skills, and allowing students to learn in different ways. The qualitative research reinforces the previous points and emphasizes the need for equal access to technology and internet; professional development for educators to improve digital skills; and wellness education to promote a healthy environment for students. The results of the study offer a comprehensive plan to decrease gender-based inequities within e-learning environments.

DISCUSSION

The results of this study, based upon 358 participants' responses, demonstrate a very high level of agreement that a combination of well-designed, targeted, and inclusive strategies can help to mitigate the disparity in the utilization of e-learning technologies between men and women in institutions of higher education. The findings of the study indicate that there was an overwhelming consensus among the participants regarding the potential effectiveness of numerous proposed strategies intended to reduce gender disparities in e-learning platforms. For example, more than two-thirds of the participants agreed that e-learning platforms should offer a variety of e-learning tools, that clear instructions/guidelines should be provided, that collaborative activities should be promoted, that assessments should be included, that technical support should be available, and that interactive or gamified elements should be incorporated into the platform.

Overall, the survey results suggest that the participants do not view the gender disparities in e-learning technology as being biological or innate; rather, they believe that the disparities are socially and institutionally constructed and thus can be mitigated through purposeful pedagogical and technological design. This perception is consistent with prior research that has indicated that the majority of the gap in technology utilization between men and women is due to factors related to access, confidence, institutional culture, and the perceived relevance of the technology as opposed to an individual's innate ability to utilize it.⁴³

The results of the statistical analysis refined the perceptions expressed by the participants in terms of the impact of particular strategies. Specifically, the results of the statistical analysis confirmed that many of the strategies identified by the participants were effective in reducing the disparity in the utilization of instructional tools for e-learning. For example, strategies such as offering a wide variety of e-learning tools, facilitating open discussions among students, including regular assessments in course materials, structuring course content to reflect a variety of learning styles, supporting students in sharing their experiences with each other, providing ongoing technical assistance, and incorporating

⁴³ Qazi et al., "Gender Differences in Information and Communication Technology Use & Skills: A Systematic Review and Meta-Analysis"; Garrison, "A Brief History of the Community of Inquiry Framework (a Personal Recollection)."

gamification into courses were found to be statistically significant. These findings are consistent with prior research indicating that when inclusive e-learning platforms are designed with the intention of promoting multiple forms of engagement and support, learners' perceptions of the accessibility and usability of the platform are improved.⁴⁴

The finding that providing students with a choice of various e-learning tools was a statistically significant factor in reducing disparities in e-learning technology usage is consistent with prior research indicating that providing students with choices in e-learning platforms helps to prevent exclusionary practices, particularly toward those students who may have limited exposure to technical skills and/or have developed negative attitudes toward certain types of digital platforms. For example, Selwyn noted that students who are able to choose the e-learning tool(s) that best fit their comfort level with technology and their preferred method of learning will be less likely to avoid using a particular type of technology.⁴⁵ In addition, the finding that designing courses that include a variety of learning approaches supported constructivist and learner-centered educational theories, which propose that students learn better when the instructional approach is reflective of their cognitive diversity.⁴⁶

Additionally, the interview data collected in this study also support the notion that intermediate-level technologies that facilitate a connection between students' gender-based preferences and their learning needs are needed. The finding that open discussions and experience-sharing were important aspects of the technology use process is also consistent with prior research that has indicated that the social norms and stereotypical expectations that surround the use of technology can limit women's (and girls') participation in digital learning environments.⁴⁷ Therefore, by creating spaces where students can discuss their use of technology, share their experiences, and interact with one another in a supportive environment, institutions of higher education can promote the challenging of these social norms, promote a sense of normalcy among students regarding differing levels of computer competence, and foster a shared sense of confidence in using digital tools.

In addition, the findings of this study that regular assessments and gamification were statistically significant factors in reducing disparities in e-learning technology usage are also consistent with prior research. Specifically, prior research has shown that regular assessments encourage continued interaction with digital tools and therefore can contribute to closing skill gaps over time,⁴⁸ while prior research has also shown that when designed with inclusion in mind, gamification can increase motivation and engagement among both male and female students.⁴⁹ In this study, the respondents believed that the incorporation of gamification would serve to make the e-learning platform more appealing and less intimidating to students who were uncomfortable with complex digital platforms.

It is interesting to note that several interventions that have been shown to be effective and supported by descriptive data - including tutorials, workshops, collaborative group work, and recognition of high-quality student projects- demonstrated no statistically significant results. The lack of statistically significant results may indicate that although these strategies have merit, they may act indirectly or be dependent upon other variables; for example, teacher competence, institutional consistency, and/or prior digital exposure of students. Research has previously documented similar findings regarding the ineffectiveness of training programs when they do not integrate well with course

⁴⁴ Barbara Means, Marianne Bakia, and Robert Murphy, *Learning Online* (Routledge, 2014), <https://doi.org/10.4324/9780203095959>; Adrian Kirkwood and Linda Price, "Technology-Enhanced Learning and Teaching in Higher Education: What Is 'Enhanced' and How Do We Know? A Critical Literature Review," *Learning, Media and Technology* 39, no. 1 (2014): 6–36.

⁴⁵ Neil Selwyn, "Digital Downsides: Exploring University Students' Negative Engagements with Digital Technology," *Teaching in Higher Education* 21, no. 8 (2016): 1006–21.

⁴⁶ Kolb, *Experiential Learning: Experience as the Source of Learning and Development*.

⁴⁷ Edna Owusu-Bempah, Daniel Opoku, and Richard Sam-Mensah, "Gender Differences in E-Learning Success in a Developing Country Context: A Multi-Group Analysis," *European Journal of Education and Pedagogy* 3, no. 4 (August 2, 2022): 61–69, <https://doi.org/10.24018/ejedu.2022.3.4.410>.

⁴⁸ Garrison and Vaughan, *Blended Learning in Higher Education: Framework, Principles, and Guidelines*.

⁴⁹ Christo Dichev and Darina Dicheva, "Gamifying Education: What Is Known, What Is Believed and What Remains Uncertain: A Critical Review," *International Journal of Educational Technology in Higher Education* 14, no. 1 (December 20, 2017): 9, <https://doi.org/10.1186/s41239-017-0042-5>.

requirements and/or are presented as single events,⁵⁰ and participant interviewees' comments related to teacher preparedness and technical consistency provide additional examples of the necessity for system-wide support rather than independent strategies.

Together, the research findings suggest that achieving an equitable digital learning experience between males and females will require an evidence-based, multi-faceted strategy. Strategies that increase accessibility, flexibility, engagement through interaction, and extend engagement over time, while at the same time reducing social and institutional barriers to access, represent effective methods for creating digital learning environments that are inclusive, supportive, and responsive to diverse learners. As previous research has shown, gender equity in digital learning is possible if educators create digital learning environments that are intended to be inclusive and responsive to the varying needs of all learners. By implementing these types of strategies in policy and practice, post-secondary institutions will be able to transition from equality in appearance to true digital inclusion.

RECOMMENDATIONS

Institutions need to develop an overall strategy that makes e-learning more accessible and inclusive; develops the capacity of all students to use digital technology; provides equal access to digital tools and resources to promote equity and inclusion; addresses the social economic barriers which restrict access to digital technology by providing free or low-cost devices, free or low-cost high-speed internet and shared access to digital technologies (e.g., computers, printers, scanners etc.) to all students. The development of curricula and instructional strategies that are gender sensitive is just as important. Curricula should meet the different ways that learners learn and use multiple forms of media (e.g., video games, podcasts) to engage students and to help close the gap in understanding between students.

Providing training to build digital literacy among students and faculty is key to building the capacity of both groups to successfully utilize e-learning tools. Faculty members should be provided with training on how to manage e-learning platforms and to design effective content to deliver to their students. Faculty members should also be provided with peer-support systems and regular feedback systems so they will be able to better prepare themselves to teach online and to provide quality instruction to their students. Student and faculty activity should be monitored and evaluated regularly. Students who do not participate in their courses should be contacted to determine why they are not participating and to determine if there are any barriers to their ability to participate.

Finally, institutions and governments need to provide the necessary support to foster an equitable e-learning environment. Policies related to higher education should include a focus on equity and inclusion and require institutions to implement gender-sensitive practices. In addition, institutions need to comply with national and international standards related to the equality of education and should develop frameworks that prioritize gender inclusivity. By developing an equitable e-learning environment, institutions can provide opportunities for all students to succeed and achieve their academic goals, regardless of gender, and contribute to achieving the broader goal of equity and inclusion in higher education.

CONCLUSION

To address the gender gap in e-learning, there is a need for a comprehensive institutional approach to include the development of effective interventions, support, and evaluation of the success of those interventions. To develop inclusive and fair instructional design and ensure that each student has equal access to technology and digital tools for their academic needs, institutions must make a commitment to creating instructional design that supports different ways that students learn and are able to utilize e-learning technology. Additionally, developing programs focused on digital literacy that are available to all students (not just females), regardless of their gender, will enable students to feel confident when utilizing e-learning technologies.

In addition to developing digital literacy programs, removing both the technological barriers to e-learning and the pedagogical barriers to e-learning (i.e., providing educators with training on how to

⁵⁰ Laurillard, "Trust the Teachers: A Collaborative Approach to Learning Design Solutions."

effectively use technology and to ensure consistent delivery of course materials) are two critical elements necessary to eliminate the gender gap in e-learning. Creating a supportive community for students and educators alike, which includes dialogue and wellness initiatives, and providing opportunities for students to work collaboratively with their peers, will assist in addressing some of the issues associated with gender and e-learning.

The creation of innovative methods to enhance engagement among students (e.g., using gamification techniques) and providing students with ongoing feedback will assist in enhancing the overall educational experience of all students. Ultimately, this comprehensive approach to eliminating the gender gap in e-learning will not only afford students the opportunity to achieve equality in the area of e-learning but will also contribute to the broader objective of achieving gender equality in education and creating an educational environment in which all students may succeed.

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