Journal of Education and Learning Technology (JELT)
ISSN 2720-7730 | Print – 2961-0184
Volume 5 Issue 10 December 2024 pp 514-527
Available online at: https://noyam.org/journals/jelt/
DOI: https://doi.org/10.38159/jelt.202451011

E-Learning Framework Development for Grade 12 Accounting Learners in South African Public High Schools

Mosimanegape Elton Mokoduwe [1] & Motalenyane Alfred Modise [2]

[1] Department of Information Technology, Central University of Technology, Free State, South Africa.
[2] Faculty of Education, Central University of Technology, Free State, South Africa.

ABSTRACT

E-learning is growing rapidly and plays a critical role in the transformation of education, allowing users to gather information from endless resources. This study aims to develop a conceptual framework for Grade 12 accounting learners that can enhance teaching and learning in South African public high schools in small townships. The study is driven by the issues faced by local schools and libraries such as having inadequate and outdated accounting learning resources, and other issues such as lack of technology skills, infrastructure and teacher readiness are addressed. A systematic literature review was conducted in this study to analyze and integrate UDL principles and TAM in e-learning to complement the proposed framework for accounting learners. The findings of this study reflect a broader trend in e-learning research, where subject-specific platforms often receive less attention compared to general-purpose E-learning tools. The lack of subject-specific research on E-learning for accounting learners underscores the importance of this study. In conclusion, the findings of this paper provide a robust foundation for the design of a conceptual framework for Grade 12 accounting learners in South African public high schools in small townships.

Keywords: *E-Learning, Education, Learners, Accounting*

Correspondence
Mosimanegape Elton Mokoduwe
Email: emokoduwe@cut.ac.za

Publication History
Received: 25h October, 2024
Accepted: 27th November, 2024
Published online: 24th December, 2024

INTRODUCTION

The 4th industrial revolution is evolving drastically, making changes in every sector of the economy, including E-Learning, which is a medium used in the educational sector to enhance and modernize teaching and learning. E-learning is growing rapidly and plays an important role in the transformation of education, allowing learners to gather information from endless resources. With the advancement of smartphone technologies, e-learning offers a great opportunity to address the lack of educational resources.

E-Learning is a generic term for referring to digital learning environments such as open learning, distance learning, blended learning, and online learning.[1] The development of the e-learning

[1] Mengchi Liu and Dongmei Yu, "Towards Intelligent E-Learning Systems," *Education and Information Technologies* 28, no. 7 (July 12, 2023): 7845–76, https://doi.org/10.1007/s10639-022-11479-6; Andi Padalia et al., "E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students' Assessment," *International Journal on Advanced Science, Engineering and Information Technology* 13, no. 3 (2023): 1059–67.

© 2024 The Author(s). Published and Maintained by Noyam Journals.
This is an open access article under the CCBY license (http://creativecommons.org/licenses/by/4.0/).

system has drastically changed how learners can access learning materials. E-learning systems allow learners to access efficient and engaging materials anytime and anywhere.[2] Students' intention to use technology for learning can significantly influence engagement and successful outcomes, making this an essential component across educational levels.[3] In addition, they can create personalized training plans, allowing them to maximize their skills and abilities. Students can access educational resources without additional software on their digital devices.[4]

Even though smartphones are commonly used in South Africa, there is still a digital gap since many students cannot pay data fees or obtain their own stable internet connectivity. The framework must consider these constraints and explore how offline capabilities and cost-effective data solutions can support learning in resource-scarce areas.[5] It has been identified by researchers that accounting learners have insufficient foundational knowledge from previous grades in the subject and the results indicated that many textbooks do not adequately address accounting subject.[6]

This paper provides a comprehensive analysis of the efforts to apply E-Learning in small townships and village high schools. In the paper, firstly a systematic investigation is performed on current e-learning systems and current trends, Universal Design for Learning principles, and Technology Acceptance Model. Then propose a conceptual framework to cater for the increasing demand for e-learning within South African public high schools. The problem of this study is that, in South African public high schools especially smaller townships and villages, learners are faced with challenges such as a scarcity of textbooks and poor libraries, which obstruct the learning experience of Grade 12 accounting learners.

Despite the extensive availability of smartphones and other digital technologies, many schools in South African townships and villages remain under-resourced, especially in terms of textbook accessibility and libraries. Some learners are forced to share textbooks, which affects their ability to study alone or access learning materials outside the school. Moreover, township libraries often lack recent books.

The following questions are formulated for this study:

1. What are the key challenges and obstacles faced by Grade 12 learners in South African public high schools when engaging with e-learning systems?
    - To analyse challenges, including technological, educational, and socio-economic problems, that affect the implementation of e-learning for Grade 12 learners in public high schools.
2. Do researchers address e-learning development for Grade 12 Accounting Learners in South Africa?
    - To perform a systematic literature review on e-learning implementation for Grade 12 accounting learners in South African high schools.
3. How can UDL and TAM be incorporated in developing an effective e-learning platform for Grade 12 accounting learners?
    - To identify relationships between UDL and TAM.
    - To design an inclusive e-learning framework by integrating UDL principles according to diverse learning needs with TAM adaptation and use of e-learning framework by accounting teachers and learners in South African high schools located in townships and villages.

---

[2] Liu and Yu, "Towards Intelligent E-Learning Systems"; Padalia et al., "E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students' Assessment"; A F Rizana et al., "E-Learning Success Determinants in Higher Education: A Systematic Literature Review from Users' Perspective," *IOP Conference Series: Materials Science and Engineering* 830, no. 3 (April 1, 2020): 032012, https://doi.org/10.1088/1757-899X/830/3/032012.

[3] Padalia et al., "E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students' Assessment"; Ragad M. Tawafak et al., "Analysis of E-Learning System Use Using Combined TAM and ECT Factors," *Sustainability* 15, no. 14 (July 16, 2023): 11100, https://doi.org/10.3390/su151411100.

[4] Padalia et al., "E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students' Assessment."

[5] Silence Chomunorwa and Virimai Victor Mugobo, "Challenges of E-Learning Adoption in South African Public Schools: Learners' Perspectives.," *Journal of Education and E-Learning Research* 10, no. 1 (2023): 80–85; Eleanor Hendricks and Bonginkosi Mutongoza, "Paragons of Inequality: Challenges Associated with Online Learning at a Selected Rural University in South Africa," *The Independent Journal of Teaching and Learning* 18, no. 1 (May 31, 2023): 8–21, https://doi.org/10.17159/ijtl.v18i1.17207.

[6] Alfred Motalenyane Modise, "Pedagogical Content Knowledge Challenges of Accounting Teachers," *International Journal of Educational Sciences* 13, no. 3 (2016): 291–97.

The aim of this study is to develop an e-learning conceptual framework tailored for Grade 12 Accounting learners in South African public high schools, incorporating it with both Universal Design for Learning (UDL) principles and the Technology Acceptance Model (TAM), to increase accessibility, engagement, and academic final performance in a digital environment, ultimately to design an inclusive e-learning for learners with different backgrounds and abilities in accounting.

LITERATURE REVIEW

E-Learning in South Africa

The application of e-learning is intended to benefit both learners and teachers in various ways, including enhanced and more flexible content distribution, curriculum standardization, on-demand instructional content accessibility, increased interactive features, and convenience.[7] Many educational institutions have identified great potential for E-Learning and utilize technologies with tremendous impact on the education sector that carve a niche in the research field.[8]

Rural learners face unique challenges in adjusting to the modern way of life and learning, the latter being characterised by the leading use of online, learning management systems and applications.[9] Another issue emphasized in this study is students' ambition to use e-learning systems in the future. Studies have shown that the challenges to the implementation of e-learning in South African public high schools specifically in small townships are lack of access to computers, internet access costs, teachers having no interest and lack of motivation and technology-perceived readiness.[10] E-learning has not been fully adopted in most township high schools despite the challenges brought by the COVID-19 pandemic to the education sector.[11]

Technology Acceptance Model in E-Learning Systems

The technology acceptance model (TAM) is an information systems model that demonstrates how technology is used and accepted. Research has used TAM widely to investigate the effectiveness and ease of use of e-learning.[12] Studies also highlight the importance of Perceived Usefulness (PU), Perceived Ease of Use (PEU), and Behavioural Intention(BI) in encouraging learners to accept e-learning platforms.[13]

According to TAM, when individuals are introduced to new technology, a variety of factors influence their decision on when and when to use it. The most important elements of TAM are perceived usefulness and perceived ease of use. Perceived usefulness is the degree to which an individual thinks that utilizing a given system would improve their ability to accomplish their work. It explains whether someone can achieve their goals and objectives when using a technology resource. Perceived ease of use is the level to which an individual thinks that using a certain system would be effortless. It demonstrates that when the technology is effortless to use, then the problems are

---

[7] Rizana et al., "E-Learning Success Determinants in Higher Education: A Systematic Literature Review from Users' Perspective."
[8] Elcullada Encarnacion, R., Galang, A. A., & Hallar, B. J. (2021). The Impact and Effectiveness of E-Learning on Teaching and Learning. *International Journal of Computing Sciences Research*, *5*(1), 383–397. https://doi.org/10.25147/ijcsr.2017.001.1.47; Valverde-Berrocoso, J., del Carmen Garrido-Arroyo, M., Burgos-Videla, C., & Morales-Cevallos, M. B. (2020). Trends in educational research about e-Learning: A systematic literature review (2009-2018). In *Sustainability (Switzerland)* (Vol. 12, Issue 12). MDPI. https://doi.org/10.3390/su12125153
[9] Bekithemba Dube, "Rural Online Learning in the Context of COVID 19 in South Africa: Evoking an Inclusive Education Approach," *REMIE: Multidisciplinary Journal of Educational Research* 10, no. 2 (2020): 135–57.
[10] Silence Chomunorwa and Virimai Victor Mugobo, "Challenges of E-Learning Adoption in South African Public Schools: Learners' Perspectives," *Journal of Education and E-Learning Research* 10, no. 1 (January 24, 2023): 80–85, https://doi.org/10.20448/jeelr.v10i1.4423; Hendricks and Mutongoza, "Paragons of Inequality: Challenges Associated with Online Learning at a Selected Rural University in South Africa."
[11] Chomunorwa, S., & Mugobo, V. V. (2023). Challenges of e-learning adoption in South African public schools: Learners' perspectives. *Journal of Education and E-Learning Research*, *10*(1), 80–85. https://doi.org/10.20448/jeelr.v10i1.4423.
[12] Hassan Abuhassna et al., "Trends on Using the Technology Acceptance Model (TAM) for Online Learning: A Bibliometric and Content Analysis," *International Journal of Information and Education Technology* 13, no. 1 (2023): 131–42, https://doi.org/10.18178/ijiet.2023.13.1.1788.
[13] Madini O. Alassafi, "E-Learning Intention Material Using TAM: A Case Study," *Materials Today: Proceedings* 61 (2022): 873–77, https://doi.org/10.1016/j.matpr.2021.09.457.

overcome. Once TAM is in place, people will be willing to use the technology and have the intention to do so.[14]

Academic motivation, knowledge quality and digital literacy are beneficial to behavioural intention, which is influenced by Perceived Usefulness and Perceived Ease of Use. However, there is no significant connection discovered between Quality of Information and Perceived Usefulness, Perceived Ease of Use and Behavioural Intention, or Social Influence and Behaviour.[15]

Figure 1 below shows TAM's two components, Perceived Usefulness and Perceived Ease of Use which are impacted by external and context-dependent elements. The process of consolidating TAM has been elaborative, with various expansions developed in the research field. TAM's applications were divided into four categories based on the analysis focus: (1) Predictive factors for Perceived Usefulness and Perceived Ease of Use, (2) technology-approved frameworks, (3) moderating variables, and (4) usage and attitudes.[16]

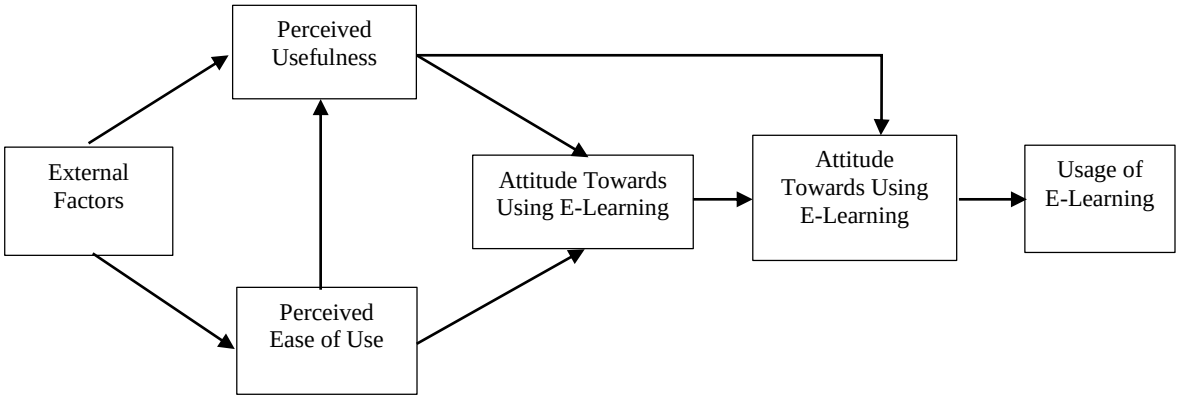

Figure 1: E-Learning Technology Acceptance Model.[17]

Studies have shown that perceived usefulness and ease of use are significant predictors of students' intention to use e-learning systems, and behavioural intention has a direct effect on the actual use of e-learning systems.[18] Moreover, Kayali and Alaaraj indicated that user satisfaction is the most important predictor of Behavioural influence (BI) followed by relative advantage (RA), social influence (SI), and perceived ease of use (PEOU).[19] Attitude mediated the effects of SI and user satisfaction on BI. Decision makers are recommended to focus on user satisfaction and increase the benefits of e-learning. The TAM model has been validated and it is still relevant to explaining the technology's acceptance from the higher learning institution perspective.[20]

Universal Design for Learning Guidelines (UDL) for inclusive E-Learning system

The Center for Applied Special Technology (CAST) created UDL in the 90s and early 2000s as a framework for producing a curriculum that is available to everybody, including learners with

[14] Debby Erce Sondakh, Kamisah Osman, and Suhaila Zainudin, "A Proposal for Holistic Assessment of Computational Thinking for Undergraduate: Content Validity," *European Journal of Educational Research* volume-9-2020, no. volume9-issue1.html (January 15, 2020): 33–50, https://doi.org/10.12973/eu-jer.9.1.33.

[15] Alassafi, "E-Learning Intention Material Using TAM: A Case Study."

[16] Ivonne Angelica Castiblanco Jimenez et al., "Commonly Used External TAM Variables in E-Learning, Agriculture and Virtual Reality Applications," *Future Internet* 13, no. 1 (December 31, 2020): 7, https://doi.org/10.3390/fi13010007.

[17] Castiblanco Jimenez et al., "Commonly Used External TAM Variables in E-Learning, Agriculture and Virtual Reality Applications"; Padalia et al., "E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students' Assessment."

[18] Chen, J. (2022). *Applying TAM to the Adoption of E-learning Platform*.

[19] Mohammad Kayali and Saad Alaaraj, "Adoption of Cloud Based E-Learning in Developing Countries: A Combination a of DOI, TAM and UTAUT," *Int. J. Contemp. Manag. Inf. Technol* 1, no. 1 (2020): 1–7.

[20] Mohamad Amiruddin Mohamad, Mohd Talmizie Amron, and Nur Hidayah Md Noh, "Assessing the Acceptance of E-Learning via Technology Acceptance Model (TAM)," in *2021 6th IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE)* (IEEE, 2021), 1–5, https://doi.org/10.1109/ICRAIE52900.2021.9704019; Sondakh, Osman, and Zainudin, "A Proposal for Holistic Assessment of Computational Thinking for Undergraduate: Content Validity."

disabilities and without disabilities.[21] UDL prioritizes inclusive and accessible learning experiences to meet the different needs of learners with unique learning abilities.[22] UDL is a pedagogical paradigm that promotes inclusive learning for all learners by designing for diversity in classrooms, including backgrounds, talents, and learning approaches.[23] UDL encourages flexible activities and evaluations that provide learners with control over their education.

The UDL designs are formed in the following three principles: Multiple means of representation, engagement, and action and expression, each principle is important for learning because it encourages teachers to give students a variety of opportunities to interact with the material, obtain information, and share their knowledge.[24] In the section below, the three guiding principles of UDL are explained:

Multiple means of engagement: emphasizes learners' unique interests, preferences, and backgrounds to help them balance effort as well as perseverance through self-regulation when learning gets difficult. This emphasized the importance of offering a variety of engaging learning opportunities.

Multiple means of representation: emphasizes the importance of providing information in different types of media and formats, ensuring accessibility and comprehension of information for all learners.

Multiple means of action and expression: highlights the need to provide different options for learners to demonstrate their knowledge, understanding, and skills, while accepting that learners have unique preferences, abilities, and limits.

The principles above collectively can help teachers create a dynamic and inclusive learning environment by encouraging learners to interact, contribute, and express their knowledge in ways that are appropriate for their unique needs and skills. The UDL framework has produced a unified concept and terminology for designing inclusive learning. The suggestions are not compulsory but can be selected when needed.[25]

Learning Management System for E-Learning

A Learning Management System(LMS) is a technology-integrated system used by schools, teachers, and students to offer flexible access to learning materials, assessments, grades, and progress. A standard LMS fosters an inclusive learning environment by facilitating online collaboration, professional training, discussions, and communication among other users.[26] The use of LMS as a tool for developing, distributing, managing, and tracking various forms of educational and training material marked a significant step forward in e-learning development, they also offer mechanisms for storing, managing, and sharing academic knowledge and resources remotely. Since its inception, LMS has evolved into a sophisticated tool for curriculum management, courseware creation, assessment, and collaboration.[27] E-learning and digital tools can effectively align with UDL concepts. Hardware, software, and technology-based settings are all examples of digital instruments used in education.[28]

---

[21] Mollie Peuler and Michelle Bartlett, "Universal Design for Learning in Online Environments," in *Society for Information Technology & Teacher Education International Conference* (Association for the Advancement of Computing in Education (AACE), 2020), 588–93; Kavita Rao, "Inclusive Instructional Design: Applying UDL to Online Learning," *The Journal of Applied Instructional Design*, 2021, https://doi.org/10.59668/223.3753; Marvin Roski et al., "Learning Analytics and the Universal Design for Learning (UDL): A Clustering Approach," *Computers & Education* 214 (June 2024): 105028, https://doi.org/10.1016/j.compedu.2024.105028; Yukyeong Song et al., "A Framework for Inclusive AI Learning Design for Diverse Learners," *Computers and Education: Artificial Intelligence* 6 (June 2024): 100212, https://doi.org/10.1016/j.caeai.2024.100212.

[22] Cindy Ann Dell, Thomas F Dell, and Terry L Blackwell, "Applying Universal Design for Learning in Online Courses: Pedagogical and Practical Considerations.," *Journal of Educators Online* 12, no. 2 (2015): 166–92.

[23] Song et al., "A Framework for Inclusive AI Learning Design for Diverse Learners."

[24] Song et al., "A Framework for Inclusive AI Learning Design for Diverse Learners."

[25] Roski et al., "Learning Analytics and the Universal Design for Learning (UDL): A Clustering Approach"; Song et al., "A Framework for Inclusive AI Learning Design for Diverse Learners."

[26] Vaughn Malcolm Bradley, "Learning Management System (LMS) Use with Online Instruction," *International Journal of Technology in Education* 4, no. 1 (December 20, 2020): 68, https://doi.org/10.46328/ijte.36.

[27] Khaleel Mershad and Pilar Wakim, "A Learning Management System Enhanced with Internet of Things Applications," *Journal of Education and Learning* 7, no. 3 (February 11, 2018): 23, https://doi.org/10.5539/jel.v7n3p23.

[28] Rao, "Inclusive Instructional Design: Applying UDL to Online Learning."

CONCEPTUAL FRAMEWORK

The proposed framework will integrate key elements from the Universal Design for Learning (UDL), Technology Acceptance Model (TAM), and LMS (that includes user interface, pedagogy, content, technology, AI, and support). The framework will prioritize learner engagement, resource accessibility, and flexibility while ensuring a user-friendly experience.

The modified TAM model assesses learners' acceptance of e-learning systems based on instructor attributes, computer self-proficiency, instructional design, perceived usefulness, perceived ease of use and intention to use.[29] TAM paradigm is used to study learners' adoption of e-learning, which includes computer self-proficiency, subjective norm, perceived enjoyment, perceived usefulness, perceived ease of use, attitude towards use, and behavioural intention to use e-learning systems for education longevity.[30]

This study examines the variables that impact instructors' perception of LMS's perceived ease of use and perceived usefulness, leading to actual use. These key variables are linked to the teachers, organization, and technology. Teachers' characteristics include self-proficiency, attitude towards system use, style of teaching, experience and innovation, while organization variables encompass organizational support technical assistance and training, motivators, and technological knowledge, and technology factors include information, system, and service quality, these variables are determined using TAM.[31]

This study proposes a novel conceptual framework that integrates the adaptability and inclusivity of UDL with the technological strength of an LMS, supported by TAM's emphasis on user uptake as shown in *Figure 2* below. This system will be designed to encourage personalized learning, increasing engagement, and ensuring ease of use for both teachers and learners by utilizing AI, inclusive design, and adaptable learning approaches. This extensive technique can drastically improve learning outcomes in South Africa's diverse learning environment.

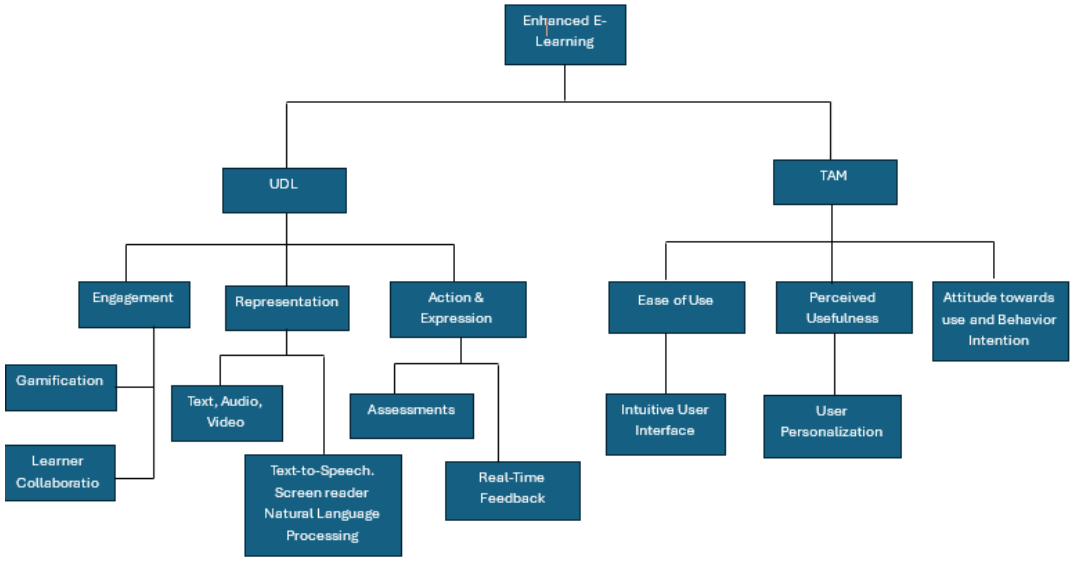

Figure 2: E-Learning Conceptual Framework integrated with UDL and TAM.

[29] R. Ibrahim et al., "E-Learning Acceptance Based on Technology Acceptance Model (TAM)," *Journal of Fundamental and Applied Sciences* 9, no. 4S (January 23, 2018): 871, https://doi.org/10.4314/jfas.v9i4S.50.
[30] Castiblanco Jimenez et al., "Commonly Used External TAM Variables in E-Learning, Agriculture and Virtual Reality Applications"; Mohammed Almulla, "Technology Acceptance Model (TAM) and e-Learning System Use for Education Sustainability," *Academy of Strategic Management Journal* 20, no. 4 (2021): 1–13.
[31] Jennifer Southmayd, "Intermediate Elementary Teachers' Perception and Use of a Learning Management System in Supporting Effective Teaching and Learning: A Mixed Methods Study," 2022.

Computer self-proficiency has impacts on ease of use, while perceived ease of use influences intention to utilize e-learning.[32] Results of the study by the author below show that even when experienced teachers were forced to embrace the e-learning systems due to the pandemic, less experienced teachers had the same level of technology acceptance as per TAM.[33]

The three principles of UDL are applied in higher education using the following: (a) applying means of representation through contact and online learning, collaboration, multimedia content delivery, and e-books; (b) applying means of action and expression by allowing students to express their understanding in any way they choose, whether orally, in writing, in hard copy, or in soft copy; and (c) application of means of engagement is applied by establishing a welcoming learning environment, regularly engaging with learners, conducting group discussions, and using assistive technologies.[34]

UDL-informed design and practice can influence e-learning in different and connected methods, including its use in fostering social, cognitive and instructional presence.[35] When developing inclusive e-learning experiences, teachers can decide how to incorporate technologies, instructional methods and delivery formats by taking UDL criteria into account in the procedures of designing the instructions. Furthermore, engaging in technology-based settings will enable teachers to offer real-world and pertinent chances for collaboration and interaction in the classroom. In these approaches, there are a lot of chances to incorporate and utilize UDL in e-learning settings that are predicated on the use of technological resources for instruction and delivery.

Active learning with the use of LMS technology and adherence to the approved curriculum should all be balanced by teachers. Teachers can define learning objectives, plan activities, model and guide debates, provide learners with options, and help them solve problems for better decision-making.[36]

METHODOLOGY

This study used a qualitative research approach followed by conducting a systematic literature review of the existing research papers on E-Learning and developing a conceptual framework for grade 12 accounting learners which consists of UDL and TAM integration. This research approach assisted in identifying relationships between the key variables of TAM and UDL models. It was essential to examine prior research, and best practices in both traditional and online learning, and gather the elements that characterized successful e-learning to provide a precise description of what effective e-learning is.

Additionally, the study took on paper selection processes that were compiled using the PRISMA principle which is, paper identification, inspections, and inclusion.[37] In addition, the study focused on studies that had been published within the previous ten years. Duplicate and ineligible entries were eliminated during paper identification, along with records that had been filtered by year and source type (book, conference, or journal). Other records were removed during the inspection phase for various reasons such as papers' length or relevance to the research topic. Lastly, only publications that will used in the research are included in the inclusion phase.

---

[32] Ibrahim et al., "E-Learning Acceptance Based on Technology Acceptance Model (TAM)."
[33] Muhterem Dindar et al., "Comparing Technology Acceptance of K-12 Teachers with and without Prior Experience of Learning Management Systems: A Covid-19 Pandemic Study," *Journal of Computer Assisted Learning* 37, no. 6 (December 19, 2021): 1553–65, https://doi.org/10.1111/jcal.12552.
[34] Imam Yuwono et al., "Implementation Of Universal Design For Learning (Udl) Concepts On Learning In Higher Education," *Education. Innovation. Diversity.* 2, no. 7 (January 15, 2024): 16–23, https://doi.org/10.17770/eid2023.2.7355.
[35] Mairead Seymour, "Enhancing the Online Student Experience through the Application of Universal Design for Learning (UDL) to Research Methods Learning and Teaching," *Education and Information Technologies* 29, no. 3 (February 14, 2024): 2767–85, https://doi.org/10.1007/s10639-023-11948-6.
[36] Bradley, "Learning Management System (LMS) Use with Online Instruction"; Dindar et al., "Comparing Technology Acceptance of K-12 Teachers with and without Prior Experience of Learning Management Systems: A Covid-19 Pandemic Study"; Mershad and Wakim, "A Learning Management System Enhanced with Internet of Things Applications."
[37] Page et al., "The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews."

To maximize the quality of search string results, the following search term was used: "E-learning, e-learning, eLearning, online learning, TAM, UDL and LMS" in combination with "systematic literature review, framework development, literature review" and words were combined differently for precise results. Between the important words are "AND" and "OR" Boolean operators. These operators help in modifying, expanding, and narrowing the search string.

Data source: For this search, two primary approaches were used. The first was to use an academic search engine at the university under study, which encompasses several academic databases including Clarivate Web of Science, EBSCO, ProQuest Central, ScienceDirect, SpringerLink, and Wiley. The second option was to use Google Scholar (http://scholar.google.com/), which is less structured but covers more publications.

Inspection process: Using a search string in the database, the researchers first filtered the articles according to their titles, determining whether or not the titles were relevant to this paper's topic. The researchers introduced an additional inspection step that required reading abstracts from the papers to check if issues arose when assessing the topic. Table 1 below shows the include and exclude process.

Table 1: Search criteria included and excluded from scientific publications

Search Criteria Included	Search Criteria Excluded
Published in English	Not published in English
Paper published in journals	Duplicate papers
Publications that focus on e-learning education and systematic literature review	Publication that does not relate to the title
Open access publication	Restricted access papers
Published between 2015 - 2024	Papers that don't focus on e-learning education

Research Paradigm

This paper followed the constructivist research paradigm. Peers employed constructivism for teaching, learning, and research. Constructivism comes in a variety of forms, including contextual, social, psychological, personal, and radical constructivism.[38]

UDL and TAM are identified and exploited at their core that tightly incorporate all the teaching and learning variables, the conceptual framework proposed, and the constructivism paradigm share the same goal which believes that learners build their own understanding and knowledge. When learners have positive views, they are very interested in using e-learning systems for education purposes. The mindset of learners determines whether an e-learning system succeeds or fails as they use it, hence, user experience, systems usability, and accessibility often influence their perception of it.[39]

When learners learn at their own speed, time, and area, they perform better individually. It implies that self-regulated and self-driven learners are the hallmarks of successful e-learning. Another component of the constructivism model is collaborativism, which holds that knowledge is produced through social and cooperative processes. It suggests that key components of the knowledge construct include participation, engagement, communication, and feedback. [40] Constructivism and collaborativism are the foundation of the e-learning perspective. Constructivism is the most important paradigm among other learning theories when it comes to the effective development of educational aspects of e-learning. Constructivism plays a crucial part in e-learning as we adapt to the rapid changes in education in the 4th industrial revolution.

[38] Devajit Mohajan and Haradhan Kumar Mohajan, "Constructivist Grounded Theory: A New Research Approach in Social Science," *Research and Advances in Education* 1, no. 4 (October 2022): 8–16, https://doi.org/10.56397/RAE.2022.10.02.

[39] Padalia et al., "E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students' Assessment."

[40] Sean Eom and Nicholas Jeremy Ashill, "Learning Outcomes and Learner Satisfaction: The Mediating Roles of Self-Regulated Learning and Dialogues," *Journal of International Technology and Information Management* 32, no. 1 (2023): 1–31; R. Safarifard et al., "Pedagogical Aspect of E-Learning in Higher Education: A Systematic Literature Review," *Knowledge Management & E-Learning: An International Journal*, September 30, 2024, 521–46, https://doi.org/10.34105/j.kmel.2024.16.024.

DISCUSSION

This study aim is to develop an e-learning conceptual framework especially for Grade 12 Accounting learners in South African public high schools to create an inclusive and engaging e-learning platform tailored to the specific needs of Grade 12 Accounting students and analyse how to incorporate both Universal Design for Learning (UDL) principles and the Technology Acceptance Model (TAM), and to determine the relationship between them. The challenges encountered by Grade 12 Accounting learners when utilising e-learning platforms are revised and contextualised with existing literature.

This discussion evaluates the framework's components, the relationship between UDL and TAM, and their relevance to the challenges and opportunities in South African public high schools, particularly in terms of addressing disparities in technology, increasing learner engagement, and improving academic performance. The successful integration of UDL and TAM has been recorded in similar settings, such as online platforms for inclusive education in higher education.[41] However, such integration in secondary school accounting education is underdeveloped.

The systematic evaluation found fewer studies focusing on E-learning improvement for Grade 12 Accounting students in South Africa. While generic E-learning research is common, few explicitly focus on specific subjects designed to meet the special needs of accounting learners. This finding is consistent with a broader trend in e-learning research, in which specific subject platforms frequently receive less attention than general-purpose E-learning tools. This gap emphasizes the need for dedicated research to address the pedagogical and intellectual needs of accounting education in the context of rapid technological innovation and new features.

UDL integration: The UDL dimension of the framework ensures that the e-learning platform is inclusive and accessible to all learners, regardless of their abilities or socio-economic backgrounds. As per prior studies, the three core principles of UDL are important in creating an inclusive education, hence they can be applied when creating a robust e-learning framework for inclusivity.

Integration of gamification and learner collaborative tools increases motivation and involvement. Gamified courses can turn typically academic accounting principles into engaging and enjoyable experiences, therefore increasing learner attention and comprehension. Collaboration technologies encourage peer learning, which is useful in areas with limited resources like South African public high schools in small townships, this is archived through UDL Means of Engagement. UDL Means Representation, multiple delivery methods, and forms, including text, audio, and video, guarantee diverse learning styles and preferences are met. Text-to-speech (TTS) and Natural Language Processing (NLP) tools improve accessibility by supporting several languages and assisting students with visual impairments or language difficulties. These technologies are essential in South Africa's multilingual context. Means of Action & Expression: The framework's use of real-time feedback and adaptive tests allows students to demonstrate their comprehension in ways that are appropriate for their capacities. This is consistent with UDL's goal of providing numerous modes of action and expression to meet the diverse requirements of its learners.

TAM integration: Many researchers use TAM components to assess the accessibility and usability of E-learning systems. Previous research indicated that intrinsic and extrinsic factors had a substantial impact on users' behavior when using E-learning. Factors that are crucial in capturing learning motivation include perceived ease of use, usefulness, and behavior intentions to utilize e-learning. The TAM dimension of the framework focuses on the platform's usability and accessibility, which are critical for increasing acceptance among teachers and learners.

Table 2 below summarizes the relationship between UDL principles and UDL in terms of the proposed conceptual framework components.

[41] Rizana et al., "E-Learning Success Determinants in Higher Education: A Systematic Literature Review from Users' Perspective."

Table 2: Summary of UDL principles and TAM

TAM	UDL	Relationship
Perceived Ease of Use	Means of Representation	Intuitive interfaces combined with a variety of material types (text, audio, video) improve availability and usability.
Perceived Usefulness	Means of Engagement	Gamification and collaborative capabilities inspire students, boosting their sense of the e-learning platform's utility.
Attitude towards Use of E-learning	Means of Action and expression	Real-time feedback and adaptive tests motivate students to interact with the platform, which promotes a positive mindset.
Behavior intentions to use E-learning	Means of Action, Expression and Representation	The combined principles of UDL ensure the platform is accessible and engaging, driving consistent use and adoption.

Ease of Use: The emphasis on an intuitive user interface means that both learners and teachers can utilize the platform with minimum training. This decreases the cognitive load associated with learning modern technologies and facilitates their smooth integration into established educational processes. Perceived usefulness features such as user personalization and customizable learning paths make the platform more relevant to individual learners.[42] For example, customizable dashboards that assess progress and propose resources can encourage students to engage more deeply with the material. This is consistent with TAM's goal of creating positive attitudes around e-learning use. Finally, the combination of UDL's inclusion and TAM's usability has an immediate effect on learners' and teachers' intentions to adopt and continue using the platform. By addressing both the technological and pedagogical components of e-learning, the framework promotes long-term engagement and successful learning results through behaviour intention of use.

Previous research has shown that user satisfaction is vital in determining e-learning performance. This is because users' intentions to continue using an e-learning system are impacted by their satisfaction with the system.[43] E-learning system quality has a significant impact on user happiness. E-learning system quality is frequently judged by the system's ease of use, interface, functionality, availability, and reaction time.

Features integrated: The integration of Artificial Intelligence (AI), Text to Speech (TTS), gamification, and Natural Language Processing (NLP) improves the framework's useability and impact.

AI allows adaptive learning by assessing learner data and recommending tailored resources and interventions. This guarantees that the platform addresses individual learning demands, which is especially important in diverse classes. NLP and TTS improve accessibility for learners who struggle with text-heavy content or language hurdles. These tools follow UDL's philosophy of giving alternative modes of representation. Gamification turns learning into an interactive process, making complicated accounting principles more accessible and understandable.

The literature review revealed that incorporating UDL into the suggested framework for Grade 12 Accounting learners will increase learner engagement and accessibility. This outcome is supported by the literature, which suggests the effectiveness of UDL in catering to different learners with unique abilities and skills.[44] The challenges faced by Grade 12 Accounting learners in utilising e-learning platforms are revised and contextualised with existing literature as highlighted by the study. In the literature, it was discovered that unique socioeconomic barriers for rural learners differ from those in

[42] Liu and Yu, "Towards Intelligent E-Learning Systems."
[43] Ibrahim et al., "E-Learning Acceptance Based on Technology Acceptance Model (TAM)"; Kayali and Alaaraj, "Adoption of Cloud Based E-Learning in Developing Countries: A Combination a of DOI, TAM and UTAUT."
[44] Roski et al., "Learning Analytics and the Universal Design for Learning (UDL): A Clustering Approach."

urban sectors.[45] However, challenges such as access to technology, learner motivation, and teacher readiness have been observed as related to previous studies conducted in the South African educational sector.[46] There are several obstacles to overcome; in many developing countries, essential e-learning resources like computers, electricity, and skills are lacking.

TAM findings indicate that teachers and learners are open-minded to e-learning as per perceived ease of use and perceived usefulness which will benefit their academic success. This has been highlighted by other researchers in TAM-Based learning.[47] However, challenge was noted in areas where there was a lack of infrastructure which affected the perceived usefulness of the system.

The findings show considerable impediments to integrating E-learning for Grade 12 accounting learners, including infrastructural and pedagogical issues. The absence of subject-specific research on E-learning for accounting students emphasizes the significance of this study. Integrating UDL and TAM offers a good starting point for creating an inclusive and effective platform customized to the needs of Grade 12 Accounting students. The application of UDL and TAM principles in this work provides a novel method for building E-learning platforms that are both accessible and user-friendly, filling gaps in current research and practice.

In conclusion, the study discovered that various factors influence e-learning implementation in township and village high schools, as well as new insights into the unique issues faced by Grade 12 Accounting students in South African public high schools. The findings show that e-learning systems must be both technologically robust and responsive to learners' socioeconomic circumstances. To fully realize the promise of this framework, policymakers and educators must prioritize improvements in digital infrastructure and teacher training. Partnerships with technology suppliers may also enable widespread adoption of advanced tools such as AI features, NLP, Gamification, and Text-to-speech, which will assist accounting students in understanding basic concepts.

RECOMMENDATIONS

Future research should explore the long-term impacts of e-learning frameworks in rural and small township communities, especially focusing on addressing social and economic problems. Additionally, the role of blended learning methods in reducing the lack of access to technological resources requires further investigation. To make use of this study's findings, policies should be updated to prioritize improving digital resources in public high schools, specifically in rural areas, and to offer training to combine UDL and TAM into e-learning environments to enhance usefulness and engagement. The study limitations of lack of infrastructure across schools highlight the need for future researchers to use a balance of unique learners' abilities, backgrounds, and socioeconomic issues they are facing in their respective communities.

CONCLUSION

This study aimed to develop an e-learning conceptual framework for Grade 12 Accounting Learners in South African public high schools guided by the TAM component of e-learning, anchored by the three UDL principles of inclusive learning. The findings highlight the significant role of UDL in designing an inclusive learning environment, especially for diverse learners which offers multiple means of engagement and expression. This study has found that researchers in this field have identified many challenges of e-learning in the rural areas of South African educational systems. E-learning platforms must therefore change to offer intelligent services. In this study another study related to e-learning was discovered, Learning Management System is defined as a system used to offer online

[45] Bekithemba Dube, "Rural Online Learning in the Context of COVID 19 in South Africa: Evoking an Inclusive Education Approach," *Multidisciplinary Journal of Educational Research* 10, no. 2 (June 15, 2020): 135, https://doi.org/10.17583/remie.2020.5607; Hendricks and Mutongoza, "Paragons of Inequality: Challenges Associated with Online Learning at a Selected Rural University in South Africa."

[46] Dube, "Rural Online Learning in the Context of COVID 19 in South Africa: Evoking an Inclusive Education Approach," June 15, 2020; Hendricks and Mutongoza, "Paragons of Inequality: Challenges Associated with Online Learning at a Selected Rural University in South Africa."

[47] Alassafi, "E-Learning Intention Material Using TAM: A Case Study."

materials. However, a notable variation was the socio-economic challenges specific to rural schools, which require additional investigation. The researchers expect that this work will help practitioners and scholars create more inclusive online learning experiences for high school education in South Africa and developing countries to enhance and modernize learning.

ACKNOWLEDGEMENTS
The author would like to thank God the man above us all for the strength and knowledge he gave to make this possible, and would also like to thank both Mother and Father for their support, and extend my gratitude to my supervisor and mentor Prof. MA Modise for his dedication, contributions and his efforts in ensuring the completion of this paper.

AUTHORS' CONTRIBUTIONS
The authors critically revisited and reviewed the paper and contributed to the manuscript revision, they reviewed and gave their approval to the completed manuscript.

CONFLICTS OF INTEREST
No conflict of interest is disclosed by authors, this paper is original and has not been published.

BIBLIOGRAPHY
Abuhassna, Hassan, Noraffandy Yahaya, Megat Aman Zahiri Megat Zakaria, Norasykin Mohd Zaid, Norazrena Abu Samah, Fareed Awae, Chee Ken Nee, and Ahmad H. Alsharif. "Trends on Using the Technology Acceptance Model (TAM) for Online Learning: A Bibliometric and Content Analysis." *International Journal of Information and Education Technology* 13, no. 1 (2023): 131–42. https://doi.org/10.18178/ijiet.2023.13.1.1788.

Alassafi, Madini O. "E-Learning Intention Material Using TAM: A Case Study." *Materials Today: Proceedings* 61 (2022): 873–77. https://doi.org/10.1016/j.matpr.2021.09.457.

Almulla, Mohammed. "Technology Acceptance Model (TAM) and e-Learning System Use for Education Sustainability." *Academy of Strategic Management Journal* 20, no. 4 (2021): 1–13.

Bradley, Vaughn Malcolm. "Learning Management System (LMS) Use with Online Instruction." *International Journal of Technology in Education* 4, no. 1 (December 20, 2020): 68. https://doi.org/10.46328/ijte.36.

Castiblanco Jimenez, Ivonne Angelica, Laura Cristina Cepeda García, Maria Grazia Violante, Federica Marcolin, and Enrico Vezzetti. "Commonly Used External TAM Variables in E-Learning, Agriculture and Virtual Reality Applications." *Future Internet* 13, no. 1 (December 31, 2020): 7. https://doi.org/10.3390/fi13010007.

Chomunorwa, Silence, and Virimai Victor Mugobo. "Challenges of E-Learning Adoption in South African Public Schools: Learners' Perspectives." *Journal of Education and E-Learning Research* 10, no. 1 (2023): 80–85.

———. "Challenges of E-Learning Adoption in South African Public Schools: Learners' Perspectives." *Journal of Education and E-Learning Research* 10, no. 1 (January 24, 2023): 80–85. https://doi.org/10.20448/jeelr.v10i1.4423.

Dell, Cindy Ann, Thomas F Dell, and Terry L Blackwell. "Applying Universal Design for Learning in Online Courses: Pedagogical and Practical Considerations." *Journal of Educators Online* 12, no. 2 (2015): 166–92.

Dindar, Muhterem, Anna Suorsa, Jan Hermes, Pasi Karppinen, and Piia Näykki. "Comparing Technology Acceptance of K-12 Teachers with and without Prior Experience of Learning Management Systems: A Covid-19 Pandemic Study." *Journal of Computer Assisted Learning* 37, no. 6 (December 19, 2021): 1553–65. https://doi.org/10.1111/jcal.12552.

Dube, Bekithemba. "Rural Online Learning in the Context of COVID 19 in South Africa: Evoking an Inclusive Education Approach." *REMIE: Multidisciplinary Journal of Educational Research* 10, no. 2 (2020): 135–57.

———. “Rural Online Learning in the Context of COVID 19 in South Africa: Evoking an Inclusive Education Approach.” *Multidisciplinary Journal of Educational Research* 10, no. 2 (June 15, 2020): 135. https://doi.org/10.17583/remie.2020.5607.

Eom, Sean, and Nicholas Jeremy Ashill. “Learning Outcomes and Learner Satisfaction: The Mediating Roles of Self-Regulated Learning and Dialogues.” *Journal of International Technology and Information Management* 32, no. 1 (2023): 1–31.

Hendricks, Eleanor, and Bonginkosi Mutongoza. “Paragons of Inequality: Challenges Associated with Online Learning at a Selected Rural University in South Africa.” *The Independent Journal of Teaching and Learning* 18, no. 1 (May 31, 2023): 8–21. https://doi.org/10.17159/ijtl.v18i1.17207.

Ibrahim, R., N. S. Leng, R. C. M. Yusoff, G. N. Samy, S. Masrom, and Z. I. Rizman. “E-Learning Acceptance Based on Technology Acceptance Model (TAM).” *Journal of Fundamental and Applied Sciences* 9, no. 4S (January 23, 2018): 871. https://doi.org/10.4314/jfas.v9i4S.50.

Kayali, Mohammad, and Saad Alaaraj. “Adoption of Cloud Based E-Learning in Developing Countries: A Combination a of DOI, TAM and UTAUT.” *Int. J. Contemp. Manag. Inf. Technol* 1, no. 1 (2020): 1–7.

Liu, Mengchi, and Dongmei Yu. “Towards Intelligent E-Learning Systems.” *Education and Information Technologies* 28, no. 7 (July 12, 2023): 7845–76. https://doi.org/10.1007/s10639-022-11479-6.

Mershad, Khaleel, and Pilar Wakim. “A Learning Management System Enhanced with Internet of Things Applications.” *Journal of Education and Learning* 7, no. 3 (February 11, 2018): 23. https://doi.org/10.5539/jel.v7n3p23.

Modise, Alfred Motalenyane. “Pedagogical Content Knowledge Challenges of Accounting Teachers.” *International Journal of Educational Sciences* 13, no. 3 (2016): 291–97.

Mohajan, Devajit, and Haradhan Kumar Mohajan. “Constructivist Grounded Theory: A New Research Approach in Social Science.” *Research and Advances in Education* 1, no. 4 (October 2022): 8–16. https://doi.org/10.56397/RAE.2022.10.02.

Mohamad, Mohamad Amiruddin, Mohd Talmizie Amron, and Nur Hidayah Md Noh. “Assessing the Acceptance of E-Learning via Technology Acceptance Model (TAM).” In *2021 6th IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE)*, 1–5. IEEE, 2021. https://doi.org/10.1109/ICRAIE52900.2021.9704019.

Padalia, Andi, Andi Jamilah, Syakhruni Syakhruni, Yuli Sectio Rini, and A Muhammad Idkhan. “E-Learning Application Usage in Higher Education with Technology Acceptance Model (TAM) for Students’ Assessment.” *International Journal on Advanced Science, Engineering and Information Technology* 13, no. 3 (2023): 1059–67.

Page, Matthew J, Joanne E McKenzie, Patrick M Bossuyt, Isabelle Boutron, Tammy C Hoffmann, Cynthia D Mulrow, Larissa Shamseer, et al. “The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews.” *BMJ*, March 29, 2021, n71. https://doi.org/10.1136/bmj.n71.

Peuler, Mollie, and Michelle Bartlett. “Universal Design for Learning in Online Environments.” In *Society for Information Technology & Teacher Education International Conference*, 588–93. Association for the Advancement of Computing in Education (AACE), 2020.

Rao, Kavita. “Inclusive Instructional Design: Applying UDL to Online Learning.” *The Journal of Applied Instructional Design*, 2021. https://doi.org/10.59668/223.3753.

Rizana, A F, U Y K S Hediyanto, F Ramadhan, and A Kurniawati. “E-Learning Success Determinants in Higher Education: A Systematic Literature Review from Users’ Perspective.” *IOP Conference Series: Materials Science and Engineering* 830, no. 3 (April 1, 2020): 032012. https://doi.org/10.1088/1757-899X/830/3/032012.

Roski, Marvin, Ratan Sebastian, Ralph Ewerth, Anett Hoppe, and Andreas Nehring. “Learning Analytics and the Universal Design for Learning (UDL): A Clustering Approach.” *Computers & Education* 214 (June 2024): 105028. https://doi.org/10.1016/j.compedu.2024.105028.

Safarifard, R., F. N. Thani, M. G. Lavasani, and E. Hejazi. "Pedagogical Aspect of E-Learning in Higher Education: A Systematic Literature Review." *Knowledge Management & E-Learning: An International Journal*, September 30, 2024, 521–46. https://doi.org/10.34105/j.kmel.2024.16.024.

Seymour, Mairead. "Enhancing the Online Student Experience through the Application of Universal Design for Learning (UDL) to Research Methods Learning and Teaching." *Education and Information Technologies* 29, no. 3 (February 14, 2024): 2767–85. https://doi.org/10.1007/s10639-023-11948-6.

Sondakh, Debby Erce, Kamisah Osman, and Suhaila Zainudin. "A Proposal for Holistic Assessment of Computational Thinking for Undergraduate: Content Validity." *European Journal of Educational Research* volume-9-2020, no. volume9-issue1.html (January 15, 2020): 33–50. https://doi.org/10.12973/eu-jer.9.1.33.

Song, Yukyeong, Lauren R. Weisberg, Shan Zhang, Xiaoyi Tian, Kristy Elizabeth Boyer, and Maya Israel. "A Framework for Inclusive AI Learning Design for Diverse Learners." *Computers and Education: Artificial Intelligence* 6 (June 2024): 100212. https://doi.org/10.1016/j.caeai.2024.100212.

Southmayd, Jennifer. "Intermediate Elementary Teachers' Perception and Use of a Learning Management System in Supporting Effective Teaching and Learning: A Mixed Methods Study," 2022.

Tawafak, Ragad M., Waleed Mugahed Al-Rahmi, Abeer S. Almogren, Muhammad Noor Al Adwan, Amjad Safori, Razaz Waheeb Attar, and Mohammed Habes. "Analysis of E-Learning System Use Using Combined TAM and ECT Factors." *Sustainability* 15, no. 14 (July 16, 2023): 11100. https://doi.org/10.3390/su151411100.

Yuwono, Imam, Mirnawati Mirnawati, Dewi Ekasari Kusumastuti, and Tenty Jahrina Ramli. "Implementation Of Universal Design For Learning (Udl) Concepts On Learning In Higher Education." *Education. Innovation. Diversity.* 2, no. 7 (January 15, 2024): 16–23. https://doi.org/10.17770/eid2023.2.7355.

ABOUT AUTHORS

Prof. Motalenyane Alfred Modise is an Associate Professor at Central University of Technology (CUT) in Free State Province, former Departmental Manager, former Acting Assistant Dean: Teaching and Learning, former Acting Senior Director of research Development Support and PG Studies and currently Assistant Dean: Research ,Innovation and Engagement at CUT, Free State Province. His research interests include accounting, transformation and change, pre-service teachers' development, pedagogical content knowledge. He is the member of the following committees: Member of Senate, Title Registration Committee, Faculty research committee Faculty board member, University Research & Innovation committee Research Forum, Ethical Committee, Promotion committee, Community engagement committee, international committee, Deputy President of Southern African Society in Education (SASE). He has proven himself as a scholar by presenting papers in the national, international conferences. He has published papers in different Journals and supervised masters and PhD students. He received funding for different projects from different stakeholders.

Mosimanegape Elton Mokoduwe holds a PostGraduate Diploma in Information Technology from Central University of Technology in Free State Province and works as a part time lecture for Information Technology Department at Central University of Technology. Passionate about software development and teaching software development. Mosimanegape Elton Mokoduwe actively integrates practical and theoretical knowledge to inspire students in the field of Information Technology. He is eager to learn more about research and publishing, this paper marks their first contribution to academic publishing, reflecting commitment to advancing knowledge in the academic research, innovation and the field of Information Technology.