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Technology and Digital Literacy as Drivers of Student Success in an Open and Distance e-Learning Environment

Kazeem Ajasa Badaru
Institute for Open and Distance Learning (IODL)
University of South Africa, Pretoria, South Africa

Abstract: This article examines the importance of technology and digital literacy to student success in an Open and Distance e-Learning (ODeL) environment. The existing literature often oversimplifies digital literacy, failing to examine how it affects a student's technological proficiency and, consequently, their success in ODeL contexts. This indicates a gap in understanding the significance of digital literacy and technology for student success in an ODeL environment. This paper employed a narrative literature review, using connectivism as the theoretical framework, to explore how digital literacy and technology are crucial to students' success in ODeL and electronically mediated environments. Connectivism emerged as a theory for the digital age, positing that technology and socialization are network phenomena that influence learning. Results demonstrate how connectivism explains the relationship between technology, digital literacy, and student success in ODeL institutions. Students from diverse backgrounds can access education anytime, from any location, given the integration of technology and digital literacy into ODeL practices, which enhances accessibility and flexibility and enriches learning experiences. It is

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recommended that educational policies require ODeL curricula to include digital literacy training, equipping students with the skills they need to thrive in technologically advanced learning environments. The study concludes that equitable access to technology and the development of digital literacy are imperative for students to succeed in ODeL environments and to reduce academic achievement gaps. This article advances a connectivist synthesis of technology and digital literacy functioning interdependently as cohesive drivers of student success in the ODeL context.

Keywords: Connectivism, Digital literacy, Open Distance and eLearning, Student success, Technology

Technologie et littératie numérique comme moteurs de la réussite étudiante dans un environnement de formation ouverte et à distance (FOAD)

Résumé : Cet article examine l'importance de la technologie et de la littératie numérique pour la réussite des étudiants dans un environnement de formation ouverte et à distance (FOAD). La littérature existante simplifie souvent excessivement les niveaux de littératie numérique, sans analyser de manière approfondie la façon dont celle-ci influence la maîtrise technologique des étudiants et, par conséquent, leur réussite dans des contextes de FOAD. Cela révèle une lacune dans la compréhension du rôle et de l'importance de la littératie numérique et de la technologie pour la réussite étudiante dans un environnement de FOAD. Cet article s'appuie sur une revue narrative de la littérature et mobilise le connectivisme comme cadre théorique afin d'explorer comment la littératie numérique et la technologie contribuent à la réussite des étudiants dans les environnements de FOAD et dans les contextes d'apprentissage médiatisés par les technologies. Le connectivisme s'est imposé comme une théorie adaptée à l'ère numérique, postulant que la technologie et la socialisation constituent des phénomènes en réseau qui influencent les processus d'apprentissage. Les résultats montrent comment le connectivisme permet d'expliquer la relation entre la technologie, la littératie numérique et la réussite étudiante dans les institutions de FOAD. Grâce à l'intégration de la technologie et de la littératie numérique dans les pratiques de FOAD, des étudiants issus de milieux divers peuvent accéder à l'éducation à tout moment et depuis n'importe quel lieu, ce qui renforce l'accessibilité et la flexibilité tout en enrichissant les expériences d'apprentissage. Il est recommandé que les politiques éducatives exigent que les programmes de FOAD intègrent une formation à la littératie numérique, afin de doter les étudiants des compétences nécessaires pour évoluer dans des environnements d'apprentissage technologiquement avancés. L'étude conclut que l'accès équitable aux

technologies et le développement de la littératie numérique sont essentiels pour permettre aux étudiants de réussir dans les environnements de FOAD et pour réduire les écarts de réussite académique. Cet article propose ainsi une synthèse connectiviste dans laquelle la technologie et la littératie numérique fonctionnent de manière interdépendante comme des moteurs cohérents de la réussite étudiante dans le contexte de la FOAD.

Mots-clés : connectivisme, littératie numérique, formation ouverte et à distance, réussite étudiante, technologie.

Introduction

The existing literature often oversimplifies digital literacy, failing to examine how it affects a student's technological proficiency and, consequently, their success in Open and Distance e-Learning (ODeL) contexts. Mantiri et al. (2019) contend that equating computer abilities with digital literacy and presuming that merely integrating technology in the classroom will inherently develop both competencies in students are misconceptions. While computer skills are basic technical skills, digital literacy encompasses higher-level skills, such as critical thinking, ethical use of digital information, and effective communication. Therefore, merely having technology in the classroom does not automatically make students digitally literate. This highlights a gap in understanding the significance of digital literacy and technology for student success in an ODeL environment.

Blended and remote learning has employed new methods and tools, such as those used in ODeL institutions, which play a significant role in expanding access to higher education (Zuhairi et al., 2020). Udeogalanya (2022) investigates the connection between academic success among United States students and computer and digital literacy. According to Udeogalanya's (2022) findings, one key factor influencing academic success is the availability of technology. Although students may be proficient in using digital technologies, studies indicate that their understanding of the potential of these tools is often limited (Doucet et al., 2020; Udeogalanya, 2022). The rapid growth of technology has significantly transformed the educational

landscape, making it essential for students to acquire digital literacy skills to succeed in the digital age. Thus, students can study from any location and take advantage of schedules that accommodate their individual needs by integrating technology with ODeL.

This paper begins with an overview of the background and context to clarify the key constructs of technology and digital literacy in this ODeL research and to situate the study within the broader scholarly discourse. In the research questions and conceptual and theoretical framework sections, we articulate the guiding inquiries and elaborate on the connectivist lens underpinning the analysis. The methodology section explains the narrative literature review design, the search strategies, the eligibility criteria, and the analytical procedures employed. The findings and discussion sections synthesise the reviewed literature thematically in relation to the research questions. The paper concludes with a summary of key insights, implications for ODeL practice and policy, and a discussion of the study's limitations.

Background and Context

Technology, a product of human innovation and creativity, was initially defined as the understanding of how to create things (Carroll, 2017; Schatzberg, 2018). The technologies used to store, process, distribute, or produce information are collectively referred to as information and communication technologies (ICTs). Santos and Serpa (2017) state that technology is the fundamental driver behind ODeL programmes. In other words, students' use of technology and digital literacy are crucial for their academic success in an ODeL context. Students and lecturers must

possess ICT skills and abilities to succeed in an ODeL environment (Lubbe, 2016; Maphosa & Bhebhe, 2019). ICTs may be traditional (such as radio, television) or modern (such as the Internet, websites, email, blogs, teleconferencing, and distance learning tools including computers, satellites, videoconferencing, web broadcasting, iPods, and virtual classrooms) (Karaman Aksentijević et al., 2021; Pradhan et al., 2018).

Participation in ODeL institutions requires a working knowledge of the digital world. Both instructors and students must be able to use ICT tools in a remote learning setting with unrestricted Internet connectivity (Maphosa & Bhebhe, 2019). According to Maphosa and Bhebhe (2019), digital literacy refers to the ability to use digital technology rather than traditional print-based methods to find, understand, create, and share information. Digital literacy emphasises the ability to read and write effectively using electronic media such as computers, mobile devices, and online platforms, where learning and communication occur through displays, multimedia content, and interactive systems, rather than through traditional methods like paper, pencils, physical books, or face-to-face lectures.

The concept of digital literacy was first coined by Gilster (1997) to describe a unique way of thinking that extends beyond simply typing on a keyboard and using technology, encompassing an understanding of digital environments. Digital literacy, then, goes beyond just knowing how to use technology. It also includes knowing how to use digital platforms effectively, assessing the trustworthiness of online information, and creating digital materials that support learning, work, or community

participation. People can perform reading and writing tasks (digital literacy) using technology and digital devices. This study uses the American Library Association's definition of digital literacy, which aligns with ODeL. The Association defines digital literacy as "the ability to use information and communication technologies to access, evaluate, produce, and convey information, requiring both cognitive and technical skills" (Fenner-Mcadoo, 2019, p. 1). In other words, digital literacy refers to the skills and competencies needed to effectively:

- Use digital technology in social, cultural, educational, and economic domains;
- Assess information and its sources;
- Recognize potential dangers associated with the digital world and
- Adjust to the digital age (Karagul et al., 2021; Ervianti et al., 2023).

Digital literacy is crucial for maximizing the effective use of technology in education (Smidt et al., 2017). Ervianti et al. (2023) conducted a study to examine the impact of digital literacy on students' learning outcomes. The study highlights the significant impact of digital literacy on a person's learning outcomes. Ervianti et al. (2023) assert that a person's understanding, application, and engagement with digital and information technology can significantly influence their learning success. Students today acquire information and learn differently because digital literacy encompasses the use of technology, a wider range of materials, and online learning environments (Ervianti et al., 2023).

However, students must learn to recognise biased material and assess the dependability and credibility of online sources. Also, it has always been a rule of

academic honesty that students use and reference sources fairly. However, this rule is more important and complicated in digital settings. Digital content is easy to copy and share, yet it often lacks clear authorship or consistent quality control. The author argues that this increases the likelihood that people will plagiarize, misattribute, or rely on biased or incorrect information. Ethical use of digital information requires that people employ a higher level of critical thinking, which involves carefully evaluating the integrity of sources, giving credit where it is due, adhering to copyright and licensing rules, and accurately representing information. Focusing on the ethical use of digital content does not mean that ethical standards have changed; it simply means that students must work harder to navigate digital information landscapes.

Competence in digital communication also facilitates efficient teamwork and idea sharing in online learning environments, such as ODeL. The ability to navigate the complex digital environment, make informed decisions, and actively participate in the knowledge society is enabled by ODeL students' mastery of digital literacy. According to the New York City [NYC] Department of Education (as cited in Mantiri et al., 2019), being digitally literate is more than having a smartphone and YouTube access. It entails knowing how to use several technological tools effectively. An individual with digital literacy can effectively utilise technology to find and assess information, connect and collaborate with others, create and distribute unique content, and leverage the Internet and technological tools to achieve numerous academic, professional, and personal goals (Mantiri et al., 2019).

By utilising technology effectively and developing digital literacy, ODeL students can go beyond the confines of traditional education. They can access various resources, collaborate with others worldwide, and acquire essential skills for the digital age. Students will be empowered, educational outcomes will improve, and a more inclusive and equitable educational system will be facilitated by embracing these critical determinants of student success. While technology and digital literacy have been studied independently, this article advances a novel synthesis of these concepts through the lens of connectivism. We offer a cohesive theoretical understanding of the interdependent roles of technology and digital literacy in driving student success in the ODeL context.

Research Questions

Given this background, the article is guided by the following questions:

1. Why is effective technology integration critical in ODeL?
2. How does technology catalyze student success in the ODeL environment?
3. Why is digital literacy important for student success in the ODeL context?
4. How do technology and digital literacy contribute to student success in the ODeL environment?

Theoretical and Conceptual Framework

This review is grounded in connectivism as its theoretical framework. The theory of connectivism is well-suited to the organizational structures of ODeL institutions, which are primarily online learning environments. The theoretical framework of connectivism systematically draws on relevant literature to explain the

relationships among technology, digital literacy, and student success in the ODeL context. This gives the analysis and interpretation a clear structure. The conceptual framework emphasises the interdependence of factors in ODeL, which is imperative for achieving educational outcomes in distance learning environments. ODeL students must have access to technology and possess the digital competencies to utilise it proficiently, thereby contributing to their academic success.

Connectivism emphasises belonging and shared knowledge, positing that student success is fostered through learners' ability to create, navigate, and utilise digital networks (Kropf, 2013). Connectivism was proposed by Siemens (2004) and Downes (2012) as a theory for the digital age. According to the theory of connectivism, digital literacy is essential for students to navigate online spaces, assess the reliability of information, and participate easily in online collaborations and conversations (Hendricks, 2019; Şahin, 2012). Connectivism is based on eight principles (Ayalon & Aharony, 2024; p. 4; Siemens, 2004):

a. *Learning and knowledge rest in the diversity of opinions;*
b. *Learning is a process of connecting specialised nodes or information sources;*
c. *Learning may reside in non-human appliances;*
d. *The capacity to know more is more critical than what is currently known;*
e. *Nurturing and maintaining connections is needed to facilitate continual learning;*

f. *The ability to see connections between fields, ideas, and concepts is a core skill;*

g. *Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities;*

h. *Decision-making is a learning process. Choosing what to learn and the meaning of incoming information are seen through a shifting reality.*

Researchers in online learning have utilised the connectivist theory as a conceptual framework, incorporating technology and examining the nodes and connections that students form within the connectivist learning environment (Siemens, 2004; Ayalon & Aharony, 2024). Connectivism uses various nodes to link hundreds of networks, enabling synchronous and asynchronous learning (Kropf, 2013). These connections give people access to millions of trustworthy information sources they may copy, reproduce, and distribute through their social networks. They also allow people to remove, evaluate, and discard material that is erroneous, unnecessary, or untrustworthy (Kropf, 2013). Social learning through networks is known as connectivism. Stephen Downes describes it as "the thesis that knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks" (Duke et al., 2013, p. 6). Networked learning experiences can be facilitated via social media, discussion forums, online platforms, and collaborative technologies (Shrivastava, 2018; Smidt et al., 2017).

Technology provides the nodes and network, digital literacy is the skill to navigate the network, and student success is the outcome of effective connection formation and knowledge flow. The tools that technology gives students to make and

sustain connections help them realize connective ideas. In ODeL environments, digital literacy is a necessity for effective engagement. Learning to use digital platforms, identify trustworthy sources, and participate actively in online debates are skills students need. According to Ervianti et al. (2023), students with strong digital literacy skills actively participate (or connect) in online forums, group debates, and other collaborative platforms. These interactions can enhance comprehension and learning by facilitating the exchange of ideas with instructors and fellow students (Ervianti et al., 2023). Student success in an ODeL institution is influenced by their level of digital literacy and their ability to utilise technology for learning. Students who are adept in digital literacy will ultimately be more successful because they will be better equipped to interact with online content, collaborate with peers, and navigate the challenges of virtual learning environments.

In this study, technology encompasses the diverse tools, platforms, and resources used for teaching, learning, and communication in ODeL environments. This technology may include learning management systems (LMS), educational software, virtual classrooms, and other digital resources that enhance the learning experience. Digital literacy was previously understood as the practical knowledge and competencies required to operate computers efficiently and use the Internet safely (Schwartz, 2019; Karagözoğlu & Gezer, 2022). This included the ability to use, understand, and critically assess digital technologies and information (Fenner-Mcadoo, 2019; Kasımoğlu et al., 2022; Schwartz, 2019). It also encompassed the skills and competencies necessary for students to effectively utilise digital tools and navigate

online information (Karagözoğlu & Gezer, 2022). For this study, digital literacy refers to skills that facilitate student engagement with digital learning materials, online collaboration, and effective communication in the ODeL environment.

The critical component of student success is proficiency in a subject sustained long enough to obtain a reliable postsecondary degree (Scott, 2018). The Council on Higher Education defines student success as "Enhanced student learning to increase the number of graduates with traits that are personally, professionally, and socially beneficial" (Scott, 2018, p. 3). Calvert (2014) states that the Open University UK, a distance learning institution, defines student success as attaining study goals, with completion and retention monitored throughout the academic career. Students must utilise their digital literacy skills to employ accessible technology tools efficiently in this setting. ODeL environments are characterised by their reliance on digital tools for content delivery and remote learning, rendering technology and digital literacy essential. The conceptual framework generally indicates that integrating digital literacy and technology fosters student success in an ODeL context. For this study, success encompasses not only academic achievement but also involvement and overall satisfaction with learning outcomes.

Methodology

The study employed a narrative literature review (Hughes, 2012; Hettithanthri & Hansen, 2022). A narrative review of literature is a conventional approach to analysing and summarising the corpus of literature, which tends to favour a qualitative interpretation of the body of knowledge on a particular topic; however, no

generalization or cumulative knowledge is sought from the reviewed papers (Badaru & Mphahlele, 2023; Paré & Kitsiou, 2017). As an ODeL researcher and educator, the author adopted a narrative literature review because it enables a comprehensive integration and synthesis of existing literature, well-suited to addressing the study's objectives (Ferrari, 2015; Record-Lemon & Buchanan, 2017).

The study objectives were to:

1. Explain reasons for effective technology integration in an ODeL context;
2. Analyze how technology catalyzes student success in the ODeL environment;
3. Demonstrate how digital literacy is critical for student success in the ODeL environment; and
4. Discuss how technology and digital literacy catalyze student success in the ODeL environment.

Research Procedure

This section describes the general steps involved (Table 1) and the methodology employed in the narrative literature review, including the research methods used. It outlines the methodical procedures used to identify, select, and synthesise pertinent literature, alongside the methodological choices that guaranteed coherence with the study's research questions, theoretical framework, and analytical methodology.

***Table 1**. Overview of the Review Procedure*

Steps	Review Activities
Step 1	Formulate the research questions and/or objectives for the review.
Step 2	Search for the extant literature relevant to the research topic and objectives of the review.
Step 3	Screen the selected articles for inclusion and exclusion using established criteria.
Step 4	Extract relevant and required data to answer the research questions for the review.
Step 5	Analyze and interpret the data included in the final review paper.

***Source:** Adapted from Templier & Paré (2015)*

The researcher established the rationale behind the review, determined the research questions and/or objectives, and clarified the terms *technology, digital literacy, and student success* within an ODeL framework. Essential elements of the review methodology process, including research questions, assist in locating and selecting relevant studies and guide the analysis approach (Jesson et al., 2011). The next steps of the process involved finding relevant materials and selecting which sources to include or exclude from the review. The researcher searched through reputable databases and established criteria for evaluating each chosen paper for inclusion or exclusion. Searching for relevant data to answer the study questions constituted the next step. The researcher meticulously scrutinised each article to ensure the extracted data were suitable and pertinent to addressing the study's inquiries and/or goals. The researcher completed the process by collecting, summarizing, aggregating, organizing, and comparing the data, including evidence from the reviewed papers, in the final draft of the article.

Search Strategies

The search was conducted using Google Scholar, Scopus, ScienceDirect, and Web of Science databases. We selected these databases because they encompass a broad range of high-quality, peer-reviewed literature across education, educational technology, and remote learning. Many people are familiar with these databases for their strict indexing rules, ability to track citations, and broad range of subjects. These are all important for identifying both empirical and theoretical research relevant to technology, digital literacy, and student success in ODeL contexts. Papers from 2011 to 2024 were selected based on whether they addressed technology, digital literacy, and student success in ODeL, and on their inclusion in the academic literature, encompassing research dissertations and peer-reviewed articles. Ninety-two percent of the final thirty-one (31) studies included in this article were published in the last ten years.

***Table 2**. Search Strategy Using the Boolean Operators*

Boolean Operator	Searched Terms/Keywords
OR	"Technology OR digital literacy" AND "Open distance and eLearning"
AND/OR	"Technology," OR "digital literacy," OR "Student Success," AND "Open distance and eLearning.

***Source:** Author's compilation (2025)*

Applying the Boolean operator "AND/OR" as described by Jahan et al. (2016), the researcher used relevant terms or keywords as the search strategies indicated in Table 2 above. The data search was conducted in an iterative, multi-stage approach

rather than a single round, in tandem with the tradition of narrative review methodology (Badaru & Mphahlele, 2023). A preliminary database search identified 118 studies that could be useful. These studies were then vetted based on a set of established criteria, resulting in the inclusion of 31 studies in this final paper. During the full-text analysis, reference lists of highly pertinent and theoretically significant works were scrutinised to uncover additional essential sources via backward citation tracking.

Eligibility Criteria for Inclusion and Exclusion

As mentioned, the 118 publications selected for screening were reviewed based on their abstracts. The final article comprises 31 relevant publications, selected from 63 screened publications. The results from the 31 assessed materials should be viewed as a "snapshot" of the current discussion on the topic (Downes, 2019, p. 114), rather than an empirical review of the entire literature, even though they are not entirely representative. Over 80% of the 31 studies that comprised the final draft of this article were peer-reviewed, with the remaining studies comprising policy briefs, research theses, and/or dissertations. Table 3 displays the eligibility criteria for data inclusion and exclusion.

***Table 3**. Eligibility Criteria for Data Inclusion and Exclusion*

S/N	Inclusion Criteria	Exclusion Criteria
1.	Data must be published in English.	Data published in other languages.
2.	Data must focus on open, distance, online, or blended learning contexts.	Not related to digitally mediated learning.

S/N	Inclusion Criteria	Exclusion Criteria
3.	Data must examine technology and/or digital literacy as central components of learning.	Exclusively focused on face-to-face instruction.
4.	Data must address student success outcomes stemming from digital literacy and access to technology.	Unrelated to student success arising from access to technology and applying digital literacy.
5.	Data that has relevant contributions to addressing research questions.	Data that has no relevant contributions to addressing the study's research questions.

Source: *Author's compilation (2025)*

Data Analysis

A theory-informed thematic narrative synthesis (Watson, 2020), guided by the study's theory of connectivism and conceptual framework, was employed for data analysis. Rather than coding primary qualitative data, we synthesised relevant studies focusing on technology, digital literacy, and student success in ODeL environments. We reviewed all the papers in their entirety to identify common themes on digital skills, learning outcomes, and access to and use of technology. Descriptive labels were applied to pertinent textual sections and later categorised into analytical codes based on the fundamental constructs of the study's framework.

These codes were iteratively refined into analytically independent themes by examining conceptual boundaries and reducing overlap. For example, digital access was separated from platform usability, and operational skills were separated from critical digital interaction. We examined the themes by comparing them across various research studies to determine whether they were similar or distinct. The completed

thematic structure was clearly linked to the research questions as summarised in Table 4. In line with a narrative review methodology, the synthesis prioritised conceptual integration and theoretical elucidation over frequency-based analysis or statistical aggregation.

***Table 4**. Mapping of Thematic (Narrative) Coding and Supporting Literature*

Constructs	Themes	Thematic Coding	Analytical Dimensions	Sources
Technology	**RQ#1**: Technology integration in ODeL contexts	Digital access and usability.	Infrastructure, LMS design, and connectivity as a learning network.	(Zuhairi et al., 2020; Smidt et al., 2017; Mahlangu, 2018; Saidi et al., 2021; Badaru & Adu, 2022; Dorsah, 2021; Maré & Mutezo, 2021; Olugbara et al., 2023; Boutsika & Kadianaki, 2019).
Technology	**RQ#2**: Technology in student success	Network connectivity.	Interaction affordances and communication channels.	(Barnett et al., 2013; Maré & Mutezo, 2021; Mtombeni, 2020; Netanda, 2020; Pavel et al., 2015; Pitsoe & Baloyi, 2015; Letseka & Karel, 2015).
Digital literacy	**RQ#3:** Digital literacy in student success	Information evaluation, operational and self-regulated skills.	Source credibility, ethical use of digital content, tool proficiency, adaptability, and learner autonomy.	(Maphosa & Bhebhe, 2019; Santos & Serpa, 2017; Lubbe, 2016; Ervianti et al., 2023; Udeogalanya, 2022; Mtombeni, 2020; Tang & Chaw, 2016; Latip et al., 2022; Santos et al., 2019; Johnston, 2020; Karpati, 2011).

Constructs	Themes	Thematic Coding	Analytical Dimensions	Sources
Student success	**RQ#4:** Technology and digital literacy in student success	Learning attainment, engagement, and agency.	Persistence, participation, and self-efficacy.	(Latip et al., 2022; Ervianti et al., 2023; Letseka & Karel, 2015; Ayalon & Aharony, 2024; Hendricks, 2019; Downes, 2019; Tan et al., 2020; Yustika & Iswati, 2020; Lopez Islas, 2013).

Table 4 shows 36 citation examples from 31 different sources. Some studies are deliberately depicted across multiple constructs to illustrate their conceptual significance across multiple analytical dimensions within the connectivist framework, rather than to signify source duplication. More precisely, Table 4 provides a concise synthesis of the theme narrative coding, associating the fundamental constructs of technology, digital literacy, and student success with the study's research questions, analytical dimensions, and relevant literature. It demonstrates how technology is constructed as the foundational infrastructure of ODeL, encompassing digital access, platform usability, and network connectivity. Additionally, it illustrates how digital literacy impacts learning through information evaluation, the development of operational skills, and self-regulated engagement. Furthermore, it shows how student success is measured by learning attainment, persistence, and learner agency. The table shows that the literature addresses analytical issues, ensuring a consistent and rigorous review.

A spreadsheet in Excel was used to document the significant elements of the research designs and findings from the carefully analysed peer-reviewed articles and other grey literature (Laux, 2018). The researcher also noted the title, purpose, results, conclusion, and recommendations for each paper in the Excel spreadsheet. Based on the data's thematic arrangement, the main themes and codes emerging from the evaluated literature were considered during the data analysis phase. There were four main themes:

- Technology integration in ODeL;
- Technology and student success in ODeL;
- Digital literacy as a critical competency for student success; and
- Technology and digital literacy for ODeL student success.

Findings

This section presents and interprets the findings of the narrative literature review in relation to the study's research questions and conceptual framework. The results combine data from the 31 studies included in this review. Table 4 shows how these studies are distributed across themes and constructs, rather than listing them as separate, non-overlapping sources. Utilising a theory-informed thematic synthesis, this section integrates information from the reviewed literature to analyse the interplay between technology and digital literacy influencing student success within ODeL environments.

Theme 1: Technology Integration in ODeL

Regarding the role of technology in the transformation of ODeL into a technology-based system, Zuhairi et al. (2020) acknowledge that:

> *Research highlights the importance of technology in providing academic and non-academic support to develop more flexible, interactive, and personalized learning environments, which require new teaching and learning support for open, distance, and online students (p. 15).*

The above assertion is corroborated by Mahlangu (2018) in their study, where they argue as follows:

> *Distance learning can benefit universities by introducing flexibility into the learning process, leveraging technologies and interdisciplinary approaches to teaching and learning. The use of technologies and interdisciplinary approaches is a key factor in distance education. The advantages of technology in distance learning include the ability for students to watch lectures before class and engage in more interactive activities during class. It allows consistent content delivery because online videos can be prerecorded and shared with the rest of the class online (p. 19).*

Integrating technology into ODeL is crucial for many reasons. The ability to access educational opportunities and resources across a wide range of locations, particularly in rural or disadvantaged areas, is made possible by technology's ability to overcome geographic barriers. With more people having access to education, the process becomes more democratic. Technology enables asynchronous learning, allowing students to access course materials anytime, anywhere. This flexibility will significantly benefit individuals with family obligations, job responsibilities, or other commitments. It is challenging for distant learning institutions and students to keep up with the rapid technological changes (Mahlangu, 2018). It is also crucial to develop

strategies that can better prepare students to utilise technology in ways that foster learning, development, and success for all students, given the increasing diversity of the student body (Mahlangu, 2018). Some distance learning institutions employ one-way (non-interactive) technologies to offer distance education programmes (Mahlangu, 2018). According to Zuhairi et al. (2020), learning support for ODeL students must be provided in new ways, given the significance of both academic and non-academic support, as well as the crucial role that technology plays in creating flexible, interactive, and personalized learning environments.

Using adaptive learning platforms and AI-driven content recommendations, technology may support individualised learning experiences. The learning experience is enhanced because students engage with content personalised to their requirements. Many LMS platforms have been widely used to assist ODeL students. An LMS is a website that facilitates communication between teachers and students. According to Badaru and Adu (2022), the LMS is a software programme that serves as a virtual classroom for online instruction and learning involving teachers and students. The LMS also enables teachers to monitor and manage their classrooms by offering online materials, discussions, assignment evaluations, and activities. In the context of ODeL, the LMS offers a productive environment for teaching and learning (Saidi et al., 2021).

Researchers believe that students who succeed in an online learning environment are well-prepared, ready to pursue their studies online, and adept at using technology to connect with instructors and fellow students (Dorsah, 2021; Maré & Mutezo, 2021; Olugbara et al., 2023). ODeL often reduces the expenses associated

with physical resources and infrastructure. With fewer material resources, educational institutions can reach a larger audience, thereby reducing the cost of education. Computer technologies are being increasingly considered for delivering distance learning due to the rise in Internet use. The top information technologies for remote learning include email, online collaborations, and web-based learning (Boutsika & Kadianaki, 2019). For a long time, the only Internet application in education was email, one of the earliest communication technologies used by remote learning institutions. Students still often communicate with teachers affordably by sending emails. Email communication has many benefits, including adaptability and convenience. However, it also has some drawbacks, such as the need for an Internet connection and the difficulty of using the complicated software and attachments that come with it (Boutsika & Kadianaki, 2019).

According to Olugbara et al. (2023), adult students in ODeL institutions find the learning process challenging due to a lack of technological abilities. Adult students find participating in group projects challenging because they lack the technical know-how to communicate online with their peers and teachers. Some ODeL students were unable to study at work due to technical difficulties, and unable to participate in educational activities at home (Olugbara et al., 2023). Still, it is essential to remember that successful integration requires careful planning, ongoing support, and addressing issues such as the digital divide, data security, and the quality of online education. ODeL institutions must ensure that technology enhances learning and is not used to replace effective instruction and interpersonal connections.

Theme 2: Technology and Student Success in ODeL

In a research thesis on "The use of technology in an open distance learning (ODL) ecosystem to achieve authentic learning", Mtombeni (2020) made the following arguments to demonstrate the significance of technology to student success in the ODeL context:

> *Technology for education can be utilized in ODeL to create activities that foster authentic learning. Using technology to enhance authentic learning provides students with powerful tools to support their learning (p. 19). Empirical evidence suggests that ICT is the driving force behind teaching and authentic learning in ODeL. ODeL is founded on technology, and without technology, it cannot be successfully operated (p. 20).*

The development of higher education institutions, particularly ODeL institutions, is greatly aided by ICTs, which catalyze innovation, excellence, and quality in this type of higher education (Pavel et al., 2015). New technologies are being widely adopted in ODeL environments (Netanda, 2020). It is possible to reduce the transactional distance between students and the institution by utilising technology for education in ODeL (Mtombeni, 2020). Significantly improving accessibility is one of the main benefits of integrating technology in ODeL environments. People can now pursue education regardless of their location. Internet connectivity enables participants to access courses and educational resources remotely, which benefits working professionals, learners from remote locations, and individuals with physical limitations. For instance, students at the University of South Africa can access learning resources and study anytime, anywhere via a technology-enabled platform such as "myUNISA." Lecturers and students communicate and interact via this platform (Pitsoe & Baloyi, 2015). This democratic approach to education fosters social inclusion and

equitable opportunities by enabling diverse students to expand their knowledge and proficiency.

Pavel et al. (2015) asserts that ICTs can provide greater access for target learners and have become vehicles for enriched pedagogical experiences, particularly for distance educators and learners separated by time and space. Authentic learning and student success in ODeL environments require a well-functioning learning community bolstered by technology (Mtombeni, 2020). The numerous benefits ICTs provide for teaching and learning are the reason for their widespread use and proliferation in the tertiary education sector worldwide. However, merely making new technology more accessible for instruction and learning does not guarantee that students will succeed academically (Netanda, 2020). Put another way, students do not always succeed when relying solely on technology. Since classroom success is the intended outcome of excellent performance, students must perform well to succeed. Netanda (2020) argues that real teaching must first occur, and that students must receive a variety of support interventions, including academic help, technical and technological support, and emotional support, to increase the likelihood that they will succeed.

It has been argued that some lecturers at ODeL institutions lack the expertise to use technology effectively for teaching (Mtombeni, 2020). According to Pavel et al. (2015), the use of technology in [ODeL] education enables staff members to become more knowledgeable about cutting-edge pedagogy, learn in novel ways, and take

advantage of more learning opportunities. ODeL institutions in developing nations often struggle to meet graduation requirements, as illustrated by Letseka and Karel (2015). Therefore, their efforts to establish learning environments that support students' success are under pressure. The real issue in education is not the complete absence of technology, but rather how it can be effectively utilised to enhance teaching and learning, thereby promoting student success.

Theme 3: Digital Literacy as Critical Competency for Student Success

Digital literacy is a crucial competency for students to succeed in ODeL institutions, according to Maphosa & Bhebhe's (2019) study, about "Digital literacy: A must for ODeL students." An example of one of their arguments is as follows:

> *Digital literacy is a skill that all students must possess for a successful ODeL programme (p. 187). . . . ODeL students should be competent in conducting knowledge searches using various online search engines. Managing and evaluating available information is important, as not all online information is relevant to the purpose (p. 190).*

Digital literacy is a critical concern in ODeL institutions. ODeL instructors and students require support in developing digital literacy to improve teaching and authentic learning through technology in the classroom (Mtombeni, 2020). As technology advances, so does the need for digital literacy (Ervianti et al., 2023). Students studying in ODeL contexts must possess these skills, as they primarily rely on digital platforms, virtual learning environments, and online resources. Because it encompasses the skill set, knowledge, and attitudes necessary to obtain digital information in an ethical, efficient, and successful manner, digital literacy is crucial for student success in ODeL institutions (Maphosa & Bhebhe, 2019). Students must

improve their digital literacy because it is a requirement for successful online learning (Tang & Chaw, 2016). The ease of e-learning, the development of students' communication skills, and the favourable correlation between digital literacy and motivation and a desire to study are just a few ways digital literacy affects learning (Latip et al., 2022).

Additional research has demonstrated the impact of digital literacy on student learning outcomes and academic accomplishment (Santos et al., 2019; Johnston, 2020). Students with a strong foundation in digital literacy can work more effectively with their classmates, participate actively in their education, and access numerous resources to expand their knowledge and comprehension. For ODeL students to connect to the outside world and obtain the knowledge they need for their studies, they must be digitally literate (Maphosa & Bhebhe, 2019). Students who are digitally literate have increased confidence in their ability to use digital resources and content for learning. With digital literacy skills, they can locate and utilise appropriate digital content, evaluate and synthesise data to further their learning, and produce and disseminate relevant digital content (Maphosa & Bhebhe, 2019). Digital literacy enhances the abilities necessary for effective learning and student success in the ODeL context. As digital archives continue to expand and offer far greater accessibility than traditional paper-based learning materials, students can access and acquire knowledge more efficiently and with greater ease (Karpati, 2011).

Theme 4: Technology and Digital Literacy as Catalysts for ODeL Student Success

Ervianti et al. (2023) examine "the influence of digital literacy on the learning outcomes of the educational technology study program students at the Indonesian Christian University of Toraja". One of their arguments about the relationship between technology, digital literacy, and student success is summed up as follows (Ervianti et al., 2023):

> *Technology skills and digital literacy can also influence student preferences and learning styles (p. 358). . . . Digital literacy enables the effective use of technological tools in the learning process, including e-books, learning videos, simulations, and online platforms. Students with good digital literacy tend to participate more actively in online group discussions, forums, and other collaborative platforms (p. 359).*

As shown in the preceding sections, technology and digital literacy play a significant role in contributing to students' success in the ODeL environment. In addition to equipping students with the knowledge and resources necessary for successful learning, technology and digital literacy also help students prepare for the digital demands of the 21st century. The findings of a qualitative study by Ayalon and Aharony (2024) indicate that teachers utilise breakout rooms to foster student collaboration and interaction. By leveraging digital tools, peers, teachers, and students can communicate and collaborate more effectively. Students can improve their interpersonal skills and participate in insightful academic conversations by participating in online forums, group projects, and virtual study sessions (Hendricks, 2019). Connectivism theory utilises technology to enhance and expand online

interactions, foster peer feedback and collaboration, and encourage learning, while teachers assume the role of facilitators (Downes, 2019; Tan et al., 2020).

Students must have access to the Internet to participate in online learning programmes. However, accessing ICTs is a matter of degree of connectivity rather than a binary choice (Yustika & Iswati, 2020, p. 69). Various degrees of connectivity associated with academic success include accessing the Internet at home rather than at a public library or cybercafé, using a computer alone, and having broadband available. ICTs offer varying degrees of flexibility in terms of temporal and computational resource availability. Students perform better academically when they have greater access to technology. For example, students disadvantaged relative to those with permanent, unrestricted home access to the Internet may have to commute to an Internet café (Yustika & Iswati, 2020).

With technology, students can access a wide range of digital learning materials, including interactive simulations, films, academic journals, and online textbooks. Access to information deepens their understanding of the subject matter and enhances their learning experience. Due to the ODeL's reliance on digital platforms and technologies, students can learn independently and on schedule. Those with family or job obligations will benefit from this flexibility, enabling them to balance their academic goals with other commitments.

According to Lopez Islas (2013), digital literacy skills related to technology and its operation are essential for online learning and are positively associated with

students' attitudes toward technology and self-efficacy. Digital literacy skills, characterized as substantial (including finding, analysing, and ethically using information to further one's personal and professional goals) might be most closely associated with a student's academic success (Lopez Islas, 2013). Digital literacy can significantly influence a person's learning outcomes (Ervianti et al., 2023). An individual's learning achievement can be influenced by their understanding, adept use, and interaction with digital and information technology (Ervianti et al., 2023). There will be barriers to learning for students if they cannot access, control, and use various learning technologies and media (Latip et al., 2022).

Discussion of Findings

While COVID-19 was not explicitly addressed as a distinct analytical issue, the pandemic context is interwoven throughout the evaluated literature and subtly influences the study's conclusions. A significant number of the studies included, especially those published between 2020 and 2022, were conducted during emergency remote teaching, when the sudden shift to fully online learning brought to light long-standing structural problems in ODeL, such as digital access, institutional readiness, student autonomy, and differences in digital literacy.

From a connectivist point of view, the pandemic was not a break in the flow of things but an accelerant that made network connectivity, technological mediation, and students' ability to navigate digital information environments even more important. Given that, the thematic synthesis incorporates problems related to COVID-19, especially in integrating technology, teaching students to use it, and helping them

succeed. It does this without treating the pandemic as a one-time event, allowing the analysis to focus on insights that can be used in ODeL practice and policy even when there is no crisis.

The theory of connectivism offers a useful theoretical framework for understanding how technology and digital literacy influence student success in an ODeL institution. Since students at ODeL institutions are frequently spread out geographically, virtual networks and connections are even more critical. The backbone of ODeL is technology (Santos & Serpa, 2017), which offers the framework for collaboration, communication, and content delivery (Kotzé, 2021). Connectivism primarily relies on technological tools to establish and preserve connections (Şahin, 2012). The theory of connectivism suggests that knowledge and the process of acquiring it are distributed. Rather than existing in a single location, knowledge is composed of networks of connections shaped by experience and interactions among people, societies, organizations, and the technologies that connect them (Goldie, 2016).

One proponent of connectivism has described it as the learning theory of the digital age, a reincarnation of constructivism, cognitivism, and behaviourism. Rather than relying on an individual's recollection of what to do (behaviourism), how to think (cognitivism), or how to produce meaning (constructivism), connectivism is an epistemological approach based on the interactions within networks, both inside the

individual mind and outside in the universe (Barnett et al., 2013). According to Bell (2011), these theories have three shortcomings:

- They consider only the intrapersonal aspect of learning;
- They do not address how technology and organizations influence learning; and
- They do not facilitate the value judgments necessary in contexts with abundant information.

From another perspective, connectivism is more a pedagogy than a theoretical framework. Connectivism maximizes the potential of digital technology in education (Smidt et al., 2017). Connectivism serves as a pedagogical tool, enabling students to connect through social networking sites or collaborative tools (Şahin, 2012). It is based on relationships in which students engage with materials that provide real-world experiences and extend learning beyond the classroom (Şahin, 2012). Technology shapes our capabilities to connect, learn, and communicate (Kotzé, 2021). According to research, digital literacy requires basic technology tools for social network connections and efficient navigation of complex, fast-paced digital environments (Şahin, 2012), such as those found in ODeL institutions. According to Kotzé (2021), connectivism provides insight into the tasks and learning skills necessary for students to succeed in the digital age.

Connectivism and open distance learning have challenged our methods of connecting, sharing knowledge, and teaching in the digital age (Hendricks, 2019). With the learner at its core, connectivism builds on constructivist learning, positioning learners as creators and connectors of new information within a framework of social

media platforms and external networks (Hendricks, 2019). Connectivism encourages students to use the materials available on the web, make connections between them, and seek clarification through conversation in networked learning environments (Smidt et al., 2017). Connectivism, however, has drawn criticism, as has any other new theory (Goldie, 2016). Its position as a learning theory in and of itself is under scrutiny, as is its claim to be a new theory that differs from conventional epistemological frameworks.

Bell (2011) asserts that numerous discourses on connectivism are predominantly theoretical or illustrative, lacking stringent procedures for evaluating its premises or establishing causal relationships between networked learning processes and educational outcomes. Consequently, critics question whether connectivism is a fully developed learning theory or merely a descriptive framework for understanding learning in digitally networked contexts (Clarà & Barberà, 2014; Downes, 2019). The ideals of diversity, autonomy, openness, and emergent knowledge may be jeopardized when the theory of connectivism is embedded within its network, according to earlier research (Goldie, 2016). However, Goldie (2016) argues that the theory of connectivism may offer a helpful perspective on how learning occurs in our interconnected and digitally saturated environment, despite several drawbacks.

Conclusion

This study emphasises the significance of technology and digital literacy as crucial factors in promoting student success in ODeL contexts. Since technology

allows for remote access to the Internet, students can access instructional materials and resources at any time and from any location. This flexibility is particularly helpful for students with other obligations, such as a job or family responsibilities. Large-scale digital libraries and repositories can be established using technology to benefit ODeL students. Students can expand their knowledge range and depth through e-books, articles, videos, and interactive simulations. Technology enhances the efficacy and engagement of the learning process by making it easier to incorporate multimedia elements, such as movies, animations, and simulations. Digital tools and platforms often incorporate adaptive learning technologies. These tools are also used to assess each student's development individually and to adapt the learning process to meet their needs, ensuring they receive support commensurate with their skill level.

Students are taught to access information, analyse data, and apply their knowledge to practical scenarios, thereby succeeding in a rapidly changing digital environment. Students exposed to technology in an ODeL environment gain digital skills that are becoming increasingly useful in the workplace. ODeL fosters a lifelong learning mindset with the use of technology. Students become increasingly adept at adapting to various learning styles and technologies, a critical skill in a rapidly evolving labour market. Open and distance learning institutions are made more accessible, engaging, and effective by the environment that technology and digital literacy provide. When thoughtfully and effectively integrated, these catalysts offer a flexible, interactive, and customised learning environment that greatly enhances student success in ODeL.

For students to succeed in ODeL environments and to reduce gaps in academic success, equitable access to technology and the development of digital literacy are key. While technology and digital literacy have been studied individually, this article offers a novel synthesis through the lens of connectivism, providing a cohesive theoretical model for understanding their interdependent roles in driving student success. This model, in turn, generates specific, actionable implications for ODeL policy and practice.

Implications for ODeL Practice and Policy

ODeL institutions should integrate adaptive learning platforms, expand LMS capabilities, and provide instructors with adequate technological training to boost ODeL practices. They must address the digital divide by providing reasonably priced access to gadgets and the Internet, and specialized training for staff and students to promote digital literacy. Strong support networks, quality control of technology tools, and investments in infrastructure and research are also necessary to provide inclusive, accessible, and productive learning environments. Educational regulations should require ODeL curricula to include digital literacy training, providing students with the necessary tools to thrive in technologically advanced learning environments. For ODeL institutions to be accessible, policymakers should invest in robust digital infrastructure, including digital devices and high-speed Internet, particularly in underserved areas.

Limitations of the Study

As a narrative review, this study synthesises existing literature, rather than generating new primary data. The narrative literature review process has been shown to have various limitations by Rumrill and Fitzgerald (2001), including its inability to accurately replicate research findings. Reviewers may focus on a few studies or ignore others to make a point (Paré & Kitsiou, 2017). If a narrative literature review primarily relies on previously condensed conclusions rather than rigorously evaluating primary data, it may diminish the depth of insight. Unlike systematic reviews, it can be challenging for other researchers to replicate the methods or validate the results of narrative reviews, as they do not necessarily follow a standardized process.

This study is particularly limited by potential subjectivity in article selection, inadequate coverage, and the lack of quantitative effect estimation or causal inference. The extensive and varied body of literature on technology, digital literacy, and ODeL student success could have led to the exclusion of important research or elements. With the rapid development of digital tools and technology, the literature review covering the period from 2011 to 2024 may soon become outdated, thereby reducing the study's long-term applicability. To mitigate these limitations, the researcher employed the following:

- Well-defined inclusion and exclusion criteria;
- An iterative screening process;
- A transparent and theory-driven thematic coding methodology that directly connects the literature to the research questions; and
- A backward citation analysis.

The various research designs and contexts make it challenging to compare them directly. However, thematic abstraction enables combining concepts while preserving differences in perspective. The study offers an interpretive analysis rather than a quantitative analysis. It is important to emphasise that this article is a narrative literature analysis. As a result, neither ethical approval nor human participation is required.

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Author

Kazeem Ajasa Badaru, PhD, served as a postdoctoral research fellow at the University of South Africa (Muckleneuk Campus, Pretoria, South Africa) from 2023 to 2025. He earned his doctorate in political education from the University of Fort Hare, South Africa. His earlier academic training includes a bachelor's degree in political science, history, and teacher education, as well as a master's degree in political science from the University of Ibadan, Nigeria. His research interests span political and policy studies, intergovernmental relations, political education, teaching and learning-supported technologies in higher education, teacher education, education and security, Sustainable Development Goal 4 – Quality Education for All, and transformative leadership in Africa. He is currently pursuing an additional degree in policy studies in the Department of Political Science at Clemson University in the United States.